NAVAL POSTGRADUATE SCHOOL

MONTEREY, CALIFORNIA

THESIS

INTEGRATING MONETARY AND NON-MONETARY REENLISTMENT INCENTIVES UTILIZING THE COMBINATORIAL RETENTION AUCTION MECHANISM (CRAM)

by

Brooke Zimmerman

December 2008

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This research addressed the potential retention and cost impacts of providing an optimal individualized portfolio of non-monetary and monetary incentives to influence reenlistment and retention behavior in enlisted Sailors by exploring three mechanisms for administrating enlisted retention: a purely monetary auction, a Universal Incentive Package (UIP) auction, and the Combinatorial Retention Auction Mechanism (CRAM).

The mechanisms were simulated, their outcomes compared and their respective strengths and weaknesses were explored. CRAM clearly outperformed the monetary and UIP auctions. Cost savings to the Navy ranged from 25 to 80% over monetary incentives alone.

Additionally, this research addressed the force-diversifying potential of CRAM. It was shown, for the sample used, that offering certain non-monetary incentives changed the demographic mix of Sailors retained.

By allowing Sailors to choose only those benefits which suit them, the Navy can eliminate the waste associated with unwanted benefits while at the same time empowering its members.

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INTEGRATING MONETARY AND NON-MONETARY REENLISTMENT INCENTIVES UTILIZING THE COMBINATORIAL RETENTION AUCTION MECHANISM (CRAM)

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LIST OF ABBREVIATIONS AND ACRONYMS

AC   Air Traffic Controller (Navy rating)

ACOL   Annualized Cost of Leaving

AFQT   Armed Forces Qualification Test

BAH   Basic Allowance for Housing

BAS   Basic Allowance for Subsistence

CBO   Congressional Budget Office

CIWS   Close-In Weapon System

CLC   Corporate Leadership Council

CNP   Chief of Naval Personnel

CRAM   Combinatorial Retention Auction Mechanism

DOD   Department of Defense

DON   Department of the Navy

EAOS   End of Active Obligated Service

FC   Fire Controlman (Navy rating)

GAO   Government Accountability Office

MOE   Measure of Effectiveness

NEC   Navy Enlisted Classification

NMI   Non-Monetary incentive

NPC   Navy Personnel Command

OPTEMPO   Operational Tempo (how often a unit deploys)

PERSTEMPO   Personnel Tempo (how often an individual is
            deployed)

QOL	Quality of Life
QOS	Quality of Service
RBS	Royal Bank of Scotland
SRB	Selective Reenlistment Bonus
SWO	Surface Warfare Officer
TAD	Temporary Additional Duty
UIP	Universal Incentive Package
USMC	United States Marine Corps
VP(AP)	Varying Percentile Cost (all positive)
VP(HP)	Varying Percentile Cost (high positive)
WTA	Willingness to Accept
WTP	Willingness to Pay

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I.   INTRODUCTION

*Don't tell me what you value, show me your budget
and I'll tell you what you value.*

-author unknown

A.   PURPOSE

This research will address the potential retention and
cost impacts of providing an optimal individualized
portfolio of non-monetary and monetary incentives to
influence reenlistment and retention behavior in enlisted
Sailors.

Although the idea of flexible benefits packages has
been present in corporate America since the early sixties
and gained popularity by the early eighties,[1] it is a very
recent idea to the U.S. Navy. The military benefits'
package has long been characterized by a diverse set of
benefits designed to include everything any Sailor might
want. It also provides numerous "benefits" that many
Sailors do not need, desire, or use. To paraphrase the
Chief of Naval Personnel (CNP), VADM Mark E. Ferguson's
comment at the 2008 Navy Workforce Research Conference:
Why are we giving childcare benefits to an 18-year-old
single Sailor with no dependents?[2]

By allowing Sailors to choose only those benefits that
suit them, the Navy can eliminate the waste associated with

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[1] Michel Tremblay, Bruno Sire, Annie Pelchat. 1998. "A Study of the
Determinants and of the Impact of Flexibility on Employee Benefits
Satisfaction," *Human Relations* 51, no. 5 (May 1): 667-688.
http://www.proquest.com (accessed July 20, 2008).

[2] Mark E. Ferguson, VADM, USN, "Keynote Speaker," (Eighth Annual Navy
Workforce and Research Conference, Rosslyn, Virginia, May 5, 2008).

unwanted benefits while at the same time empowering its members by giving them a voice in their compensation structures.

The Navy attempts to obtain desired end-strength by balancing personnel losses with accessions and retention. The retention of qualified experienced Sailors has historically been considered a more cost-effective option than to recruit and train new accessions to replace those losses -- especially those "in critical skill specialties with high training costs or demonstrated retention shortfalls."[3] The Selective Reenlistment Bonus (SRB) "provides a bonus to enlisted personnel who reenlist in a skill characterized by inadequate manning, low retention, and high replacement costs payable to an individual with between twenty-one months and sixteen years active service. Payment is based on monthly basic pay times a specified award level … times the number of additional years of obligated service."[4]

According to the U.S. Government Accountability Office (GAO), the Department of Defense's budget "for the Selective Reenlistment Bonus Program has more than tripled … from $235 million in fiscal year 1997 to an estimated

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[3] Office of the Under Secretary of Defense for Personnel and Readiness, *Military Compensation Background Papers*, 6th ed. (Washington, D.C.: U.S. Government Printing Office: 2005), 610. http://www.loc.gov/rr/frd/pdf-files/Military_Comp.pdf (accessed October 25, 2008).

[4] U.S. Department of the Navy, *Department of the Navy Fiscal Year (FY) 2009 Budget Estimates Submission, Justification of Estimates, February 2008, Military Personnel, Navy* (Washington, D.C.: Government Printing Office, 2008), 85. http://www.finance.hq.navy.mil/FMB/09PRES/MPN_Book.pdf (accessed: November 6, 2008).

$789 million in fiscal year 2002."[5] The Navy's portion of the SRB funds was estimated at $323 million in 2007, $358 million in 2008, and $359 million in 2009.[6] According to a GAO study in 2005, "[m]ost [service] components … met their aggregate retention goals in the past 6 fiscal years [2000-2005], but the Navy experienced retention shortages in fiscal year 2005 … The Navy did not meet its end-of-year retention goals: for service members with less than 6 years of service by about 2 percent and for service members with 6 to 10 years of service by about 8 percent."[7] They further assert: "The fact that over 112,000 positions [DoD-wide] in consistently under-filled occupational specialties were vacant in fiscal year 2005 raises concerns about whether the authorized personnel levels for these occupational specialties are based on valid requirements."[8]

Thus, the Navy is paying significantly more money in SRBs and still not consistently meeting its retention goals. It also puts itself in a position to have to

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[5] U.S. Government Accountability Office, *Military Personnel: Management and Oversight of Selective Reenlistment Bonus Program Needs Improvement* (Washington, D.C.: Government Printing Office, 2002), 5. http://www.gao.gov/new.items/d03149.pdf (accessed: February 17, 2008).

[6] U.S. Department of the Navy, *Department of the Navy Fiscal Year (FY) 2009 Budget Estimates Submission, Justification of Estimates, February 2008, Military Personnel, Navy* (Washington, D.C.: Government Printing Office, 2008), 85. http://www.finance.hq.navy.mil/FMB/09PRES/MPN_Book.pdf (accessed: November 6, 2008).

[7] U.S. Government Accountability Office, *Military Personnel: DOD Needs Action Plan to Address Enlisted Personnel Recruitment and Retention Challenges* (Washington, D.C.: Government Printing Office, 2005), 8 and 11. http://www.gao.gov/new.items/d03149.pdf (accessed: February 17, 2008).

[8] U.S. Government Accountability Office, *Military Personnel: DOD Needs Action Plan to Address Enlisted Personnel Recruitment and Retention Challenges* (Washington, D.C.: Government Printing Office, 2005), 22. http://www.gao.gov/new.items/d03149.pdf (accessed: February 17, 2008).

justify current manning levels. The system is broken and
needs to be fixed. This research will explore one possible
"fix."

B.   RESEARCH QUESTION

This research addressed the following questions:

1.   Primary Question

Can a combinatorial auction mechanism providing
individualized portfolios of non-monetary and monetary
incentives provide a more cost-effective means to influence
reenlistment/retention behavior than monetary incentives
alone?

2.   Secondary Questions

a. What mix of monetary/non-monetary incentives would
be both valued by Sailors and cost-effective for the Navy?

b. What auction design would allow the Navy to tailor
monetary/non-monetary reenlistment incentive packages to
individual Sailors while simultaneously economizing on Navy
resources?

c. If both reenlistment incentive programs are
optimally designed, what cost savings might the Navy expect
by moving from purely monetary reenlistment incentives to a
portfolio of monetary/non-monetary incentives?

d. How would population representation be affected by
these reenlistment incentives?

C.   SCOPE AND LIMITATIONS

This thesis focused on applying non-monetary
incentives in a retention auction mechanism to U.S. Navy

Sailor reenlistments. It did not address other services nor did it specifically analyze officer retention. The findings, however, may be applicable to all services at any pay grade.

D.   METHODOLOGY

The methodology in this study included both qualitative and quantitative analyses.

This thesis focused on exploring three mechanisms for administrating enlisted retention: a purely monetary auction, a Universal Incentive Package (UIP) auction, and the Combinatorial Retention Auction Mechanism (CRAM). The latter two auctions included various non-monetary incentives (NMIs) that appeared to be important to Sailors based on prior research as well as survey research conducted as part of this thesis.

The mechanisms were simulated, their outcomes compared, and their respective strengths and weaknesses explored. The main measure of effectiveness (MOE) was total cost to the Navy. This assumed constant reenlistment goals across mechanisms. The models, however, can easily be adapted to reflect a constant total cost assumption with increasing/decreasing retention rate as the MOE.

As part of a prior NPS student project, a survey was recently conducted asking Surface Warfare Officers what amount of money they would require to agree to stay in the Navy for two additional tours as Department Heads. They were then asked how much of that money they would be willing to give up for certain non-monetary benefits. The results showed the top non-monetary compensation attracters

for Surface Warfare Officers to be: increased graduate education opportunities, guaranteed base housing, geographic stability, leave sabbatical (for education and pregnancy), telecommuting, and additional money for dependents (education and daycare).

This current thesis conducted a similar non-monetary incentive survey targeting enlisted personnel, specifically the Air Traffic Controller (AC) and Fire Controlman (FC) ratings in the Navy. Appendix A contains a copy of the full Enlisted Retention Survey.

Information about the Sailors' valuation distributions for various non-monetary incentives, which was required to run the simulations, was not available. Thus, the survey was administered to obtain the necessary data. The survey method chosen provided quick turnaround time, ease of data collection, and uniformity of response format.

The data obtained from the Enlisted Retention Survey was used in the simulations to estimate the performance of the three retention auctions. There is little to no information currently available regarding the cost to the Navy of the NMIs offered. The cost of the offerings was estimated based on the value distributions gleaned from the survey responses.

A mathematical simulation of the three auctions was created using Microsoft Excel and Oracle Crystal Ball. The model predicted individual retention outcomes, benefits received, total, and per-Sailor cost to the Navy for the monetary-only, UIP, and CRAM auctions.

Two cost estimation techniques, which were labeled Varying Percentile cost - All Positive (VP(AP)) and Varying Percentile cost – High Positive (VP(HP)), which will be described in Chapter VI, were used to ensure thorough cost estimation and future applicability of the analysis.

The final product is a program that is applicable to any community (enlisted or officer, surface or aviation) by simply changing the offerings and associated reservation values.

Three survey questions provided the respondents an opportunity to answer in an open text format. Chapter IV summarizes and discusses these responses.

E.   ORGANIZATION OF STUDY

This research is a continuation of Drs. Pete Coughlan and William Gates' on-going investigation into the cost-effectiveness of offering monetary/non-monetary reenlistment retention packages, or flexible benefits packages, to naval personnel. Previous student theses addressed many of the initial design questions that will be included in the literature review.

While there does not appear to be any published studies directly on-point with this research, discussions of other key questions surrounding this study were found in the published literature.

The key questions to be answered were:

1.   What is the right mechanism for allocating compensation offerings? What auction design would best suit this purpose? Would

participants respond to these mechanisms
appropriately? (Chapter II).

2.   How have civilian corporations pursued and
implemented flexible benefits offerings?
(Chapter III).

3.   Can individuals handle the complexities and
volume of decisions required for flexible
benefits auctions? (Chapter III).

4.   What offerings would be most desired by Navy
personnel? What is the feasibility of these
offerings? (Chapter III).

5.   What subgroup of Naval Personnel should be
examined for this research? (Chapter IV).

Chapter IV also addresses the Enlisted Retention
Survey administration, target population, sample
statistics, and open text responses. Chapter V outlines
the auction mechanisms' format and implementation. Chapter
VI presents the auction simulations and results. Chapter
VII discusses potential diversity implications of the CRAM.
Chapter VIII provides a summary, conclusions and
recommendations.

II. AUCTION THEORY

Presently the size or amounts of the Selected Reenlistment Bonuses are predetermined in "response to market forces as retention changes in ratings, NECs, and skills."[9] Specifically, planners at the Naval Bureau of Personnel determine which ratings and Navy Enlisted Classifications (NECs) qualify as undermanned, suffering from low retention or have high replacement costs. They then determine the level of cash bonus at which the Navy can expect "a reasonable prospect of enough improvement in retention in response to the award to justify the cost."[10] This determination is made primarily through use of the Annualized Cost of Leaving Model (ACOL). This model theorizes that individuals compare their projected Military earnings stream with their possible civilian earnings stream plus their taste for civilian life to determine whether to continue military service.[11] By using this model, planners derive the estimated minimum SRB amount that would induce the requisite number of Sailors to stay in the Navy.

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[9] Chief of Naval Operations (CNO), OPNAVINST 1160.8A, Department of the Navy, Office of the Chief of Naval Operations (Washington, D.C.: 2007).

[10] CNO, OPNAVINST 1160.8A.

[11] Michael L. Hansen and Jennie W. Wenger, "Is the Pay Responsiveness of Enlisted Personnel Decreasing?" *Defence and Peace Economics* 16, no.1 (2005): 33. Hansen and Wenger suggest including "basic pay, allowances for subsistence and housing, and retirement pay .... [and any] SRB for which the individual is eligible."

A.   COST OF RETENTION MECHANISM CURRENTLY USED BY THE NAVY

By using a predetermined SRB amount as described
above, the Navy planners are actually attempting to
determine the marginal SRB required by the final (or most
reluctant) Sailor that must reenlist to meet end-strength.
Unfortunately, all previous (or more-willing) Sailors must
also receive this amount under the current system, as shown
in Figure 1.

Current SRB Determination
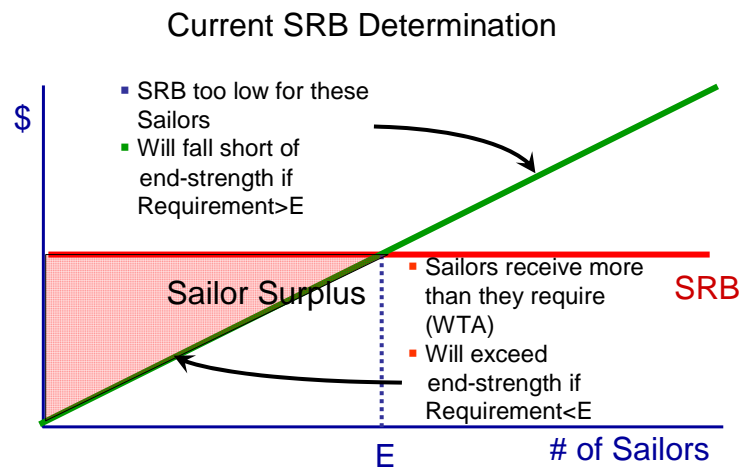
Figure 1.   Cost of Existing SRB Determination

If planners underestimate the optimal SRB level, i.e.,
set the bonus too low, there will not be enough Sailors who
are willing to retain, the Navy will not meet end-strength
goals, and readiness will suffer. If planners overestimate
the optimal SRB level, i.e., set the bonus too high, too
many Sailors will be willing to retain and the Navy could
overshoot end-strength. This would result in budget
overages. Alternatively, if the bonus was set above the
optimal SRB level, reenlistments could be suspended once
end-strength was reached. This would be sub-optimal as

retention would be based on a first-come basis, heavily
favoring those whose end of active obligated service (EAOS)
falls in the first half of the fiscal year. This would not
only be potentially unfair to those with later EAOS dates,
but it would not retain those Sailors (regardless of EAOS
date) who are most willing to remain in the Navy. This
would potentially raise later retention costs.

The green line in Figure 2 represents the labor supply
curve or Sailors' reservation costs to remain in the Navy.
The blue line represents the optimal SRB. The two red
lines illustrate the result of setting the SRB level too
high or too low.
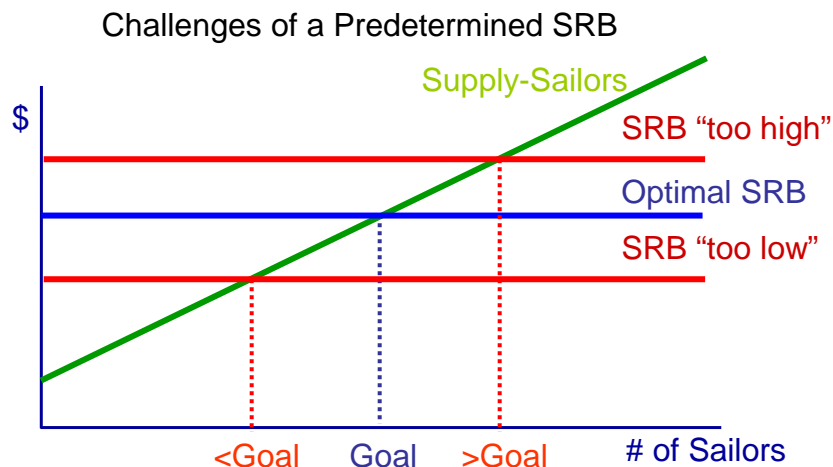
Figure 2.   Predetermined SRB Challenges

This thesis will illustrate an auction mechanism that
endogenously determines the precise (and minimum) SRB level
necessary to induce the right number of reenlistments and
overcome the flaws of the current system. Theoretically, a
retention auction would not only set the market clearing
SRB level that is appropriate for the current labor supply

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and demand conditions, but would also identify which
individual Sailors are to be retained.

B.   AUCTION DESIGN

The Encarta Dictionary defines an auction as, "a sale
of goods or property at which intending buyers bid against
one another for individual items, each of which is sold to
the bidder offering the highest price." This actually
defines the most widely understood auction: a *forward
auction.* There are numerous variations on this common type
of auction, some of which will be discussed in the
following sections.
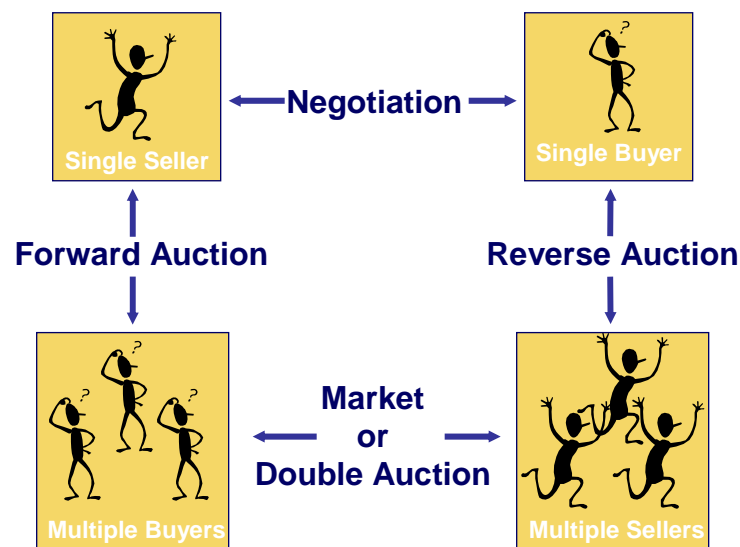
Figure 3.   Auction Variations (*From* Coughlan, Introduction
to Auction Economics)[12]

An auction is, more precisely, "an exchange
mechanism"[13] that allocates resources to the winning bidder.
Whether the winner is buying or selling, how many winners
there are, and the price the winner pays or receives is
determined by the auction variation.

1. Auction Variations

This section will discuss some of the most common
auction variations, specifically those germane to this
research. Additionally, an introduction to the
combinatorial auction, which is less common, will be
provided.

Figure 4.   Common Auction Variations (*From* Coughlan,
Introduction to Auction Economics)[14]

a. *Single-Winner Forward and Reverse Auctions*

In a forward single-winner auction, there is one
seller and multiple buyers. The winner is the highest
bidder. This is the most widely known type of auction. A

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[13] Peter J. Coughlan, "Introduction to Auction Economics."

[14] Peter J. Coughlan, "Introduction to Auction Economics."

reverse single-winner auction is characterized by multiple
sellers and one buyer. An example of this is the
competition for government contracts. The winner is the
lowest bidder.

For simplicity, the following auction types will
be described using a forward single-winner auction --
unless otherwise noted.

b.   *Open-Bid vs. Sealed-Bid Auctions*

Open-bid auctions are those in which bidders
openly declare their bid amounts or intentions. Open bid
auctions can be ascending (English auction). The bidding
starts at a minimum price and the auctioneer increases the
bid incrementally until there are no more takers. They can
also be descending (Dutch auctions). The auctioneer starts
at a predetermined price (high enough so that no bidder is
interested) and decreases incrementally until a bidder
accepts that price.

Sealed bid auctions are those in which bid
amounts are submitted (often in a roughly simultaneous
fashion) without any disclosure until after the winner is
determined. Sealed bid auctions come in two common
variations. In a first-price auction, the winner is the
highest bidder and he pays the amount he bid. In a second-
price (Vickrey) auction, the winner is still the highest
bidder. The price he pays, however, is the bid of the next
highest bidder.

c.   *Reverse Second-Price Sealed-Bid Auction*

Given the retention context, this thesis will be
focusing on reverse auctions. In a reverse auction there

is only one buyer (for example, the Navy) and many sellers
(the Sailors offering their services) who are also the
bidders.

While the results of this thesis generalize to
other reverse auction formats, the focus will be on reverse
second-price sealed-bid auctions. In a reverse second-price
auction, the lowest bidder provides the goods or services
(in this case, military labor), but *at the price of the
first excluded (next highest) bidder.*

There will be further discussion of the specific
auction formats analyzed in Chapter IV.

d.   *Bidding Strategy: Second-Price Auction*

Under a second-price auction, the optimal bidding
strategy is to bid one's true valuation. For example, if an
individual is bidding for an item which is worth $30 to him
(he would be willing to pay a maximum of $30 for the item),
then his best strategy is to bid exactly $30 for the item
in a second-price auction.

To understand this result more clearly, this
section will illustrate how one can never do better than
bidding truthfully in a second-price auction. For
simplicity, the explanation that follows employs the
following notation:

V = Your value for the object

P = Price paid for the object

S = Your surplus

B = Your bid for the object

H = Highest bid submitted by any other bidder

The following section will first demonstrate that bidding *above* your true value (i.e., choosing B > V) can only hurt you. It will then demonstrate that bidding *below* your true value (i.e., choosing B < V) can only hurt you. Figure 5 illustrates the three possible cases or outcomes which can result from bidding above your true value. Figure 6 illustrates the three possible cases or outcomes which can result from bidding below your true value.
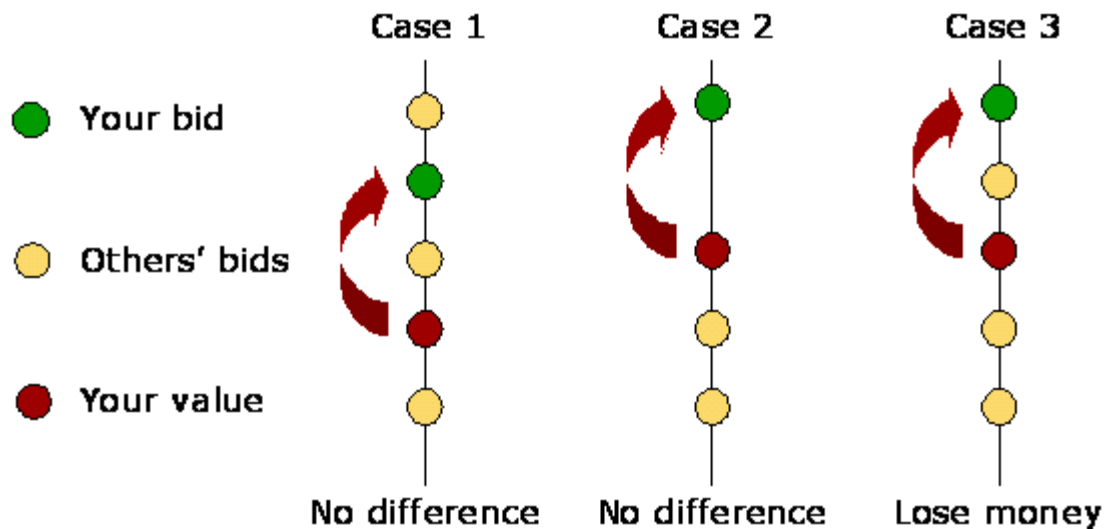
Figure 5.   Bidding Above Your Valuation (*From* Coughlan, Introduction to Auction Economics)[15]

For all cases, the reader should note that your objective as a bidder is to maximize your surplus, S. If you do not submit the highest bid (i.e., if B < H), then S = 0. If you do submit the highest bid (i.e., if B > H), then P = H and your surplus is given by S = V – P = V – H.

[15] Peter J. Coughlan, "Introduction to Auction Economics."

Case A1: H > B > V

In this case, because H > B, you are not the high bidder and you do not win the object; therefore S = 0. If you bid truthfully (B = V), you also do not win the object (because H > V) and, therefore, would also have S = 0. Thus, bidding above your true value provides no benefit in this case.

Case A2: B > V > H

In this case, because B > H, you are the high bidder and win the object; therefore S = V – H > 0. If you bid truthfully (B = V), you also win the object (because V > H) and, therefore, would also have S = V - H. Thus, bidding above your true value provides no benefit in this case, either.

Case A3: B > H > V

In this case, because B > H, you are the high bidder and win the object; therefore S = V – H, which is *negative,* because H > V: you "win" the object, but pay more than it is worth to you. If you bid truthfully (B = V), on the other hand, you would not win the object (because H > V) and, therefore, would have S = 0. Thus, bidding above your true value hurts you in this case. You would be better off bidding truthfully.
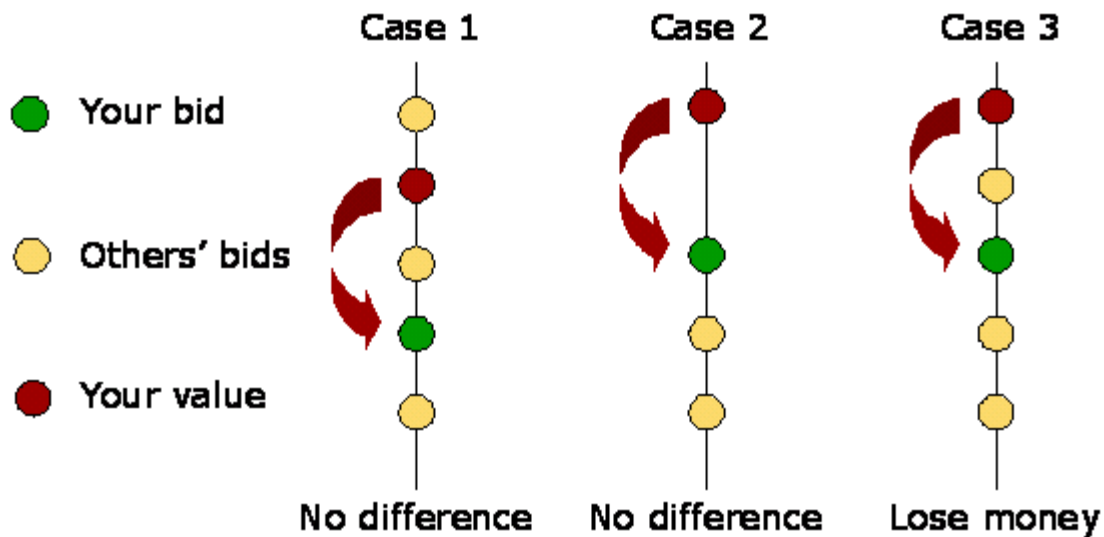
Figure 6.   Bidding Below Your Valuation(*From* Coughlan,
            Introduction to Auction Economics)[16]

Case B1: H > V > B

In this case, because H > B, you are not the high
bidder and do not win the object; therefore S = 0. If you
bid truthfully (B = V), you also do not win the object
(because H > V) and, therefore, would also have S = 0.
Bidding below your true value provides no benefit in this
case.

Case B2: V > B > H

In this case, because B > H, you are the high
bidder and win the object; therefore S = V – H > 0. If you
bid truthfully (B = V), you also win the object (because V
> H) and, therefore, would also have S = V – H.   Thus,
bidding below your true value provides no benefit in this
case.

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[16] Peter J. Coughlan, "Introduction to Auction Economics."

Case B3: V > H > B

In this case, because H > B, you are not the high bidder and do not win the object; therefore S = 0. If you bid truthfully (B = V), you would win the object (because V > H) and, therefore, would have S = V – H. This is positive because V > H. Thus, bidding below your true value hurts you in this case. You would be better off bidding truthfully.

This demonstrates that bidding anything other than your true value in a second-price auction can only hurt you. Under this auction format, truthful revelation (B = V) is the optimal bidding strategy.

e.   Bidding Strategy: First-Price Auction

Under a first-price auction, it is immediately apparent that truthful revelation (B = V) is NOT the optimal bidding strategy. If you are the high bidder (i.e., if B > H) under a first-price auction, you will win the object but the price you pay will be the amount you bid (i.e., P = B). Therefore, you will earn no surplus (S = V – P = V – B = V – V = 0). Instead, the optimal strategy is to bid some amount below your true value (i.e., to bid B < V).

By how much should you "underbid" your true value in a first-price auction? To answer this question, consider that if all bidders underbid their true values by the same fraction or amount (or, more generally, according to the same underbidding or discounting rule), the winning bidder will always be the bidder with the highest value for the object.

Because S = V – P = V – B only if you win the object and S = 0 otherwise, the amount you bid only matters if you win the object. This means that you might as well bid as if you are the winning bidder, i.e., the bidder with the highest value for the object.

Identifying the optimal bidding strategy in a first-price auction boils down to answering the following question: if you have the highest value for the object among all bidders, how low can you bid and still win the object? The answer is that you can bid as low as the second highest bid, which you can safely assume will be at or below the second highest value for the object. Thus, the optimal bidding strategy (technically, the "equilibrium" bidding strategy) in a first-price auction is to bid what you expect the next highest value would be if your value for the object was the highest value among all bidders.

f.   Revenue Equivalence

One interesting and important implication of the above-described optimal bidding strategies is that, on average, the seller of the object can expect to receive the same revenue -- whether the object is sold via first-price or second-price auction.

To see this, note that the price (or revenue) in a second-price auction will be equal to the second-highest bid. Because the optimal bidding strategy is to bid truthfully, this will be equal to the second-highest value. Under a first-price auction, the price (or revenue) will be equal to the absolute highest bid. In equilibrium, the

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high bidder in a first-price auction will bid what he expects to be the second-highest value.

Thus, under either auction format, the expected price is equal to the expected second-highest valuation. Thus, in general, the expected revenue for the seller under either auction format is the same.

C.   PRIOR THESIS WORK

Major Hudson's thesis addresses the choice between a first and second-price auction design with respect to the Navy's Targeted Separation Incentive Program in 2006. He determined that the second-price sealed bid auction "is the most efficient manner to conduct separation auctions because of its efficiency, cost effectiveness, equitability and practicality, based on recent market design and auction theory."[17]

Captain Bock's thesis applied an auction mechanism to Marine Corps Reenlistments with the Sequential Self Selection Auction Mechanism (S3AM). He demonstrated the potential cost savings when Selected Reenlistment Bonus levels can be properly determined.[18]

Ms. Tan's thesis applied auction theory to Assignment Incentive Pay through the use of a simulation that incorporated a Sailor-job matching component. When the

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[17] Daniel P. Hudson, "Utilizing Auctions as a Force Shaping Tool to Provide Voluntary Separation Incentives to Naval Personnel," (Master's thesis, Naval Postgraduate School, 2006), 38.

[18] Paul B. Bock, "The Sequential Self-Selection Auction Mechanism for Selective Reenlistment Bonuses: Potential Cost Savings to the U.S. Marine Corps," (Master's thesis, Naval Postgraduate School, 2007).

model designed was Sailor-optimal, she found that the second-price auction mechanism was most efficient.[19]

Major Norton's thesis designed an experiment to determine whether a second price auction design would be truth revealing in a retention scenario. It was also designed to determine whether participants would be able to accurately determine their optimal bidding strategy without prior training and education on the subject.[20] Captain Cook's Thesis analyzed these experiments and found that most participants initially overbid their salary requirements, but quickly determined the most beneficial strategy (truthful revelation) and adopted it consistently.[21]

The work of Lieutenants Denmond, Johnson, Lewis, and Lieutenant Commander Zegley built upon the previous studies and applied a combinatorial auction mechanism to Navy Surface Warfare Officer (SWO) retention. They incorporated non-monetary incentives in conjunction with a portion of the pecuniary bonus already offered. They found that the auction mechanism continued to provide cost savings to the Navy and adding the non-monetary incentives, in lieu of a portion of the original bonus, increased those savings

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[19] Pei Yin Tan, "Simulating the Effectiveness of an Alternative Salary Auction Mechanism," (Master's thesis, Naval Postgraduate School, 2006).

[20] William J. Norton, "Using an Experimental Approach to Improving the Selective Reenlistment Bonus Program," (Master's thesis, Naval Postgraduate School, 2007).

[21] Benjamin M. Cook, "Using a Second-Price Auction to Set Military retention Bonus Levels: An Application to the Australian Army," (Master's thesis, Naval Postgraduate School, 2008).

while preserving much of the SWOs' surplus value.[22] The research that follows builds on this final thesis and will be explained in detail in Chapters IV, V, and VI.

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[22] Constance M. Denmond, Derek N. Johnson, Chavius G. Lewis, and Christopher R. Zegley, "Combinatorial Auction Theory Applied to the Selection of Surface Warfare Incentives," (MBA professional report, Naval Postgraduate School, 2007).

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III. DETERMINING OFFERINGS

The major advantage to a solely pecuniary compensation system is its simplicity: cash pay is easy to identify and quantify. Few compensation plans, however, are this simple. It is to the employee's advantage to have a portion of his wages consist of non-monetary benefits. Savings achieved through economies of scale and corporate tax deductions in health care plans is an example. Paid vacation and sick days are another example of non-cash benefits that work to the advantage of the employee. Ms. Hattiangadi notes that in 2000 "nearly 80 percent of surveyed workers say that benefits are very important in their decision to accept or reject a job."[23] According to the Bureau of Labor and Statistics, the percentage of employees in medium and large companies with access to flexible benefits increased from 5% in 1988 to 13% in 1999.[24] In 2006, that number had risen to 28% of companies that employ 100 or more people.[25]

The Chief of Naval Operations has defined recognition of the Navy as a top 50 employer in the United States as

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[23] Anita U. Hattiangadi, *Private Sector Benefit Offerings in the Competition for High skill* Recruits, CNA Research Memorandum D0003563.A2 (Alexandria, Virginia: Center for Naval Analysis, 2001), 8.

[24] U.S. General Accounting Office (GAO), *Military Personnel: Active Duty Benefits Reflect Changing Demographics, but Opportunities Exist to Improve.* Report, GAO-02-935 (Washington, D.C.: Government Printing Office, 2002), 57.

[25] TED: The Editor's Desk, "Flexible Benefits and reimbursement accounts, April 4, 2007," Bureau of Labor and Statistics. http://www.bls.gov/opub/ted/2007/apr/wk1/art03.txt (accessed October 27, 2008).

one of his goals for 2008.[26] By examining the effort of leaders in Corporate America, the Navy can adapt and adopt their best practices to achieve this goal.

A.   CORPORATE NON-MONETARY INCENTIVE EFFORTS

1.   Total Rewards

The Corporate Leadership Council (CLC) suggests implementing a Total Rewards philosophy with respect to compensation. "A Total Rewards philosophy is a strategic means of merging the roles of the compensation and benefits function. This approach focuses on the monetary and non-monetary incentives used to attract, engage, and motivate human capital."[27]

Figure 7.   Components of a Total Rewards Philosophy (*From* Corporate Leadership Council, Total Rewards Philosophy Components and Statements)[28]

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[26] Gary Roughead, ADM, USN, "Keynote Address," (Surface Navy Association Symposium, Arlington, Virginia, January 15, 2008).

[27] Corporate Leadership Council (CLC), "Total Rewards Philosophy Components and Statements," Corporate Executive Board, 1. www.corporateleadershipcouncil.com (accessed October 24, 2008).

[28] Corporate Leadership Council, "Total Rewards Philosophy Components and Statements," 2.

They define a total rewards package as being comprised of all of the reasons why "a talented individual would want to work and remain at a company."[29] This philosophy must be clearly defined and shared with organizational employees. Employees must know that the purpose of Total Rewards is to "focus on serving the workforce, as well as organizations' business objectives."[30] Additionally, employees must be educated as to the true value of their *total* compensation.

This final point is especially relevant to the Navy. Hattiangadi notes that "[c]urrently, information about the various benefits offered to military personnel and their families is scattered among an array of websites and publications. Most private-sector companies offer materials of this type, so such a move would facilitate comparison of offered private-sector and military compensation packages."[31]

2.   Navy-Civilian Comparison Message

The Navy attempts to achieve employee recognition of benefits by releasing an annual message that compares military earnings with their civilian equivalents. While this is a worthwhile endeavor, it may not have the desired impact. Most Sailors are unaware of the true value of the Navy's compensation package. By implementing a benefits system where Sailors choose to keep and reject various non-

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[29] Corporate Leadership Council, "Total Rewards Philosophy Components and Statements," 2.

[30] Corporate Leadership Council, "Total Rewards Philosophy Components and Statements," 3.

[31] Hattiangadi, Private Sector Benefit Offerings, 127.

monetary benefits, they will be forced to examine and understand the value of their compensation packages.

A recent Naval Message[32] illustrates the significance of benefits in the overall military compensation package when compared to similar civilian occupations:

> A Petty Officer Second Class Aviation Mechanic [AM2] stationed in Norfolk with two dependents and over four years of service['s] … military gross annual salary is approximately 46,487 dollars as compared to a private sector counterpart at approximately 43,790 dollars. Breaking down the Petty Officer's total annual salary, this Sailor is making about 3,533 dollars in BAS [Basic Allowance for Subsistence], 15,324 dollars in BAH (w/dependents)[Basic Allowance for Housing with dependents], 680 dollars clothing maintenance, and base pay of 26,968 dollars. Unlike her private sector counterpart, the Petty Officer receives a tax break because allowances such as BAH and BAS are not subject to Federal Income Tax. This tax advantage increases the value of the Petty Officer's annual salary by 5,721 dollars. As a civilian, the Aviation Mechanic in this example would have to earn about 52,000 dollars to have a comparable after-tax income. This amount does not include annual indirect compensation attained such as medical, dental, vision and commissary benefits which add up to approximately 6,785 dollars.[33]

This message also points out the defined-benefits retirement plan that is provided at no direct cost to the member:

> If this same Sailor makes an informed decision and decides to stay Navy and retire after 24 years as a Senior Chief Petty Officer, she can

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[32] Chief of Naval Operations, *Pay and Compensation/Stay Navy Campaign,* DTG 212124Z MAR 08 (Washington, D.C.: 2008).

[33] Chief of Naval Operations, *Pay and Compensation/Stay Navy Campaign*, DTG 212124Z MAR 08 (Washington, D.C.: 2008).

expect …. [under the] High-3 Military Retirement, payout over 40 years of over five million dollars. As a civilian [she] would have to accrue 2,652,892 dollars at the time of retirement to receive a comparable payout. In order to achieve this amount, [she] would have to invest 57,972 dollars annually at an eight percent return over a 20-year period.[34]

3.   Example: The Royal Bank of Scotland

The Corporate Leadership Council (CLC) analyzed the Royal Bank of Scotland's (RBS) efforts when introducing a flexible benefits plan to its employees. RBS offered flexibility in existing medical and dental coverage, various levels of group rate additional insurance policies, childcare vouchers, discounted retail vouchers, and the opportunity to buy or sell vacation days among many other benefits. They determined the mix of offerings based on employee focus groups, questionnaires, and manager interviews. They defined the advantages of a flexible benefits program at RBS as shown in Figure 8.

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[34] Chief of Naval Operations, *Pay and Compensation/Stay Navy Campaign*, DTG 212124Z MAR 08 (Washington, D.C.: 2008).

> **FIGURE 2: IDENTIFIED ADVANTAGES OF A FLEXIBLE BENEFITS PROGRAMME FOR RBS[19,20]**
>
> - *Flexibility and choice*—Employees now have the ability to select the benefits, and the amount of benefit, most in line with their needs
> - *Strengthened internal and external employment brand*—Demonstrates responsiveness and understanding of employees' benefits needs and desires
> - *Increased value for money invested in benefits*—RBS can identify those benefits of greatest interest to its employees and to eliminate unpopular benefits. In addition, as employees purchase the proffered benefits, the company's subsidisation level is minimised.
> - *Alignment with already existing diversity of employees and pay structures*—Given that the company had recently diversified its pay and grading structures to be more reflective of employees' positions, it seemed a natural fit to also diversify employees' benefits options
> - *Streamlined benefits budgeting*—Clear means of assessing the exact amount spent by departments on employees' remuneration packages

Figure 8.   Advantages to RBS Flexible Benefits Plan (*From Corporate Leadership Council, Royal Bank of Scotland's Flexible Benefits Package*)[35]

CLC found that RBS met all of its objectives by introducing the plan. RBS achieved significant employee participation, employee satisfaction, recognition as an employer of choice in the United Kingdom, and company satisfaction in terms of cost-effectiveness and the ability to offer benefits most desired by employees.[36]

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[35] Corporate Leadership Council (CLC), "Royal Bank of Scotland's Flexible Benefits Package." Corporate Executive Board. www.corporateleadershipcouncil.com (accessed July, 16, 2008).

[36] CLC, "Royal Bank of Scotland."

4. Employee Satisfaction, Communication and Distributive Justice

Another important question is how flexible benefit plans affect employee satisfaction. More satisfied employees are more likely to stay at a company and require less monetary incentives.[37] This reduces retention and turnover costs. Tremblay, et al., attempted to determine what influences employee satisfaction and, more specifically, how flexible benefit plans influence employee satisfaction. They linked these research objectives to the organizational goals to "to maintain satisfaction levels and at the same time control costs."[38] They further refined their research objectives by presenting nine hypotheses that they tested:

1. The more importance individuals attach to benefits, the more satisfied they will be with those benefits

2. There is a positive relationship between inter-organizational mobility and benefit satisfaction.

3. There is a positive relationship between perception of security and satisfaction with benefits.

4. There is a positive relationship between the perception of distributive justice and benefit satisfaction.

5. The perceived importance of benefits plays a moderator role in the relationship between distributive justice and benefit satisfaction.

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[37] Ronald G. Ehrenberg and Robert S. Smith, *Modern Labor Economics Theory and Public Policy*, 10th ed. (New York: Addison-Wesley, 2008).

[38] Michel Tremblay, Bruno Sire, and Annie Pelchat. "A Study of the Determinants and of the Impact of Flexibility on Employee Benefits Satisfaction," *Human Relations* 51, no. 5 (May 1998). http://www.proquest.com (accessed July 20, 2008), 667-688.

6. There is a positive relationship between the perception of involvement in decisions related to benefits and benefit satisfaction.

7. There is a positive relationship between the perception that employee preferences are considered and benefit satisfaction.

8. There is a positive relationship between communication received and benefit satisfaction.

9. There is a positive relationship between flexibility of benefits and benefits satisfaction.[39]

To test these hypotheses, the authors examined the effects of three distinctly different benefit plans: a traditional Fixed-Benefits plan employed by an insurance company, a Modular Flexible plan (different benefit bundles to choose from) used by a University, and a Core-Plus plan (a core group of essential benefits plus other options that employees can add to the core) used by a drinks manufacturing company. They surveyed employees in each firm to capture the employees' perceptions of fairness, communication, security, and flexibility of benefits with respect to job satisfaction. By comparing these three types of plans, they were able to examine the effects of each level of flexibility -- from none to maximum -- to test their hypotheses.

They cite various studies that suggest introducing employee flexibility and choice will simultaneously increase employee satisfaction and control the rising costs of providing benefits -- especially health care.

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[39] Tremblay et al., "Benefits Satisfaction." 671-676.

The authors incorporate demographic controls in their model and, additionally, include variables designed to capture the concepts described in the hypotheses, such as benefit importance, perception of distributive justice, level of participation in the decision, and communication level of the organization. They obtained these measures through the survey given to employees in the three firms.

Their choice of three distinctly different *firms* was questionable. They note that "some differences in respondent profiles emerged from the data."[40] They report a high response rate, 42.2%, but fail to mention how representative that response was except to state that it was not entirely in keeping with the individual firm profiles. This leads the reader to question how applicable these findings are to the rest of the business community.

They were highly successful in establishing an argument for further research into flexible benefits packages and their impact on employee satisfaction, cost reduction, and attraction of non-traditional employees. Of the nine hypotheses, five were confirmed, one was refuted and three had inconclusive findings. They found communication to be the most influential aspect of benefits satisfaction. This was followed by perception of distributive justice.

This research reveals the tremendous potential of flexible benefits packages. It also underscores the necessity to communicate the scope of the company's benefits offerings and establish faith in the fairness of benefits allocation. To make an informed decision between

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[40] Tremblay et al., "Benefits Satisfaction." 676.

employment opportunities, employees must be aware of the entirety of their compensation package.

They also found some evidence to suggest that individuals value the ability to choose as highly as the actual choices themselves.[41] But can people handle such a large volume of complex choices?

B.   CONFRONTING THE COMPLEXITY OF INCENTIVE CHOICES

Van Boening et al., conducted "individual-choice decision-cost"[42] experiments to investigate the idea that flexible benefit plans have the potential to increase job satisfaction and retention. They posit that employees must perceive the new plan as more valuable *and* be willing and able to select the optimal combination of offerings. To test their hypothesis, the authors conducted "an experiment on choices over stylized benefits packages where discrete goods have multiple attributes affecting the payoff function"[43]. The hypothesis tested was that individuals would be able to make "payoff-maximizing decisions in the presence of multiple attributes …. In effect, solve a complex programming problem."[44] The authors further theorized that subjects would develop heuristics to cope with these complex situations. This hypothesis was based on previous research aimed at determining whether "human

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[41] Mark Van Boening, Tanja F. Blackstone, Michael MckKee, and Elisabet Rutstrom. "Benefit Packages and Individual Behavior: Choices Over Discrete Goods with Multiple Attributes," *Managerial and Decision Economics* 27 (2006}, 511-526.

[42] Van Boening et al., "Benefit Packages," 511.

[43] Van Boening et al., "Benefit Packages," 511.

[44] Van Boening et al., "Benefit Packages," 512.

decision making is intrinsically prone to errors [or] that
it is fundamentally efficient."[45]

The experiments were conducted at the Mississippi
research Laboratory at the University of Mississippi and
the Business, Economics, Accounting, and Marketing
Laboratory at the University of South Carolina.

The subjects were 80 student volunteers from the
respective Universities' undergraduate business schools.
No mention is made as to the demographic characteristics or
selection method of the volunteers. The statistical model
used, however, for hypothesis testing used 79 individual
dummy variables to cancel out individual biases that could
be present.

The simulation consisted of a game designed to mimic
the choices required to maximize payoff and satisfaction
from a flexible benefits package. The objective of the
game was to choose the optimal combination of cells to
achieve a payoff higher than the fixed payoff option.

The payoff from the game was the reward from selecting
a certain number of cells. The subjects were aware at all
times of the fixed payoff amount from declining to play the
game (no effort); the maximum payoff from playing the game;
and individual values relating to the choices and their
weights on the final payoff. The subjects also knew the
time remaining and the payoff they had achieved as a result
of their choices. They could select and deselect as many
cells as they wished in the four-minute time limit. They
were given a maximum cell value sum with which to achieve

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[45] Van Boening et al., "Benefit Packages," 512.

the optimal payoff from playing the game and were aware of the current cell value sum at all times. They could also choose the fixed payoff option at any time during the four-minute round. This design approximates the choices and constraints an individual might face when choosing his options under a flexible benefits plan.

The experiment consisted of a "2x2 design with [individual] cell payoff and fixed payoff option as the treatment variables."[46] The treatment variables were chosen to ensure the "variety of choices within a given matrix and the variety of optimal solutions across matrices [was] sufficiently rich for data analysis."[47] Other variables were kept constant to keep the "computational difficulty facing the subject … significant, but not overwhelming."[48]

In each round, the subjects were given the option of "playing a 'cell selection' game or accepting a known fixed payoff in lieu of playing the game."

Only 4% overall chose to take the fixed payoff. The low percentage of people selecting fixed payoff "suggests that typical subject's decision cost [of playing the game] is substantially less than 20[%] of the maximum payoff."[49] It also suggests that "the typical subject places a high implicit valuation on the flexibility in making choices as she is apparently confident in her ability to exceed the fixed payoff."[50]

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[46] Van Boening et al., "Benefit Packages," 512.

[47] Van Boening et al., "Benefit Packages," 515.

[48] Van Boening et al., "Benefit Packages," 515.

[49] Van Boening et al., "Benefit Packages," 518.

[50] Van Boening et al., "Benefit Packages," 523.

In 84% of rounds, subjects earned at least 90% of maximum payoff. When the cell payoff was low -- 20 versus 100 points per cell -- the majority of subjects earned in the 97-100% range. "A relatively low cell payoff implies that cell value is more important in determining reward."[51] Therefore, for those that place relatively low value on the number of benefits they receive, the individual value of those benefits is extremely important.

There was weak evidence that the higher the fixed payoff alternative, the more the subject earns. This has an interesting implication. The rules of the experiment were analogous to allowing employees to have the option of keeping their fixed benefits plan while shopping for the flexible plan. The authors suggest that the higher the perceived value of the traditional plan, the more likely it is that the optimal flexible plan will be discovered by the employee.

The authors identify three simple heuristics that the subjects developed:

1. "H:" Subjects focus on high cell values (700-1000); low number(<3) of cells selected; and decision cost: LOW / Payoff: LOW.

2. "M:" Subjects focus on medium cell values (350-750); 4-5 selected per round; and decision Cost/Payoff: between H and L.

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[51] Van Boening et al., "Benefit Packages," 520.

3. "L:" Subjects focus on low cell values (100–350); >6 cells selected per round; and decision Cost: HIGH /Payoff: HIGH.[52]

At least 60% of subjects appeared to have used the L heuristic (high payoff with high decision cost) in each session; 50% fit into the category overall (meaning they used it every time); and less than 10% used the H heuristic (low decision cost/low payoff) in each session (only 5% used it every time).[53]

This suggests that the majority of the people find the potential gain outweighs the mental effort required to complete the task.

In Modern Labor Economics, the authors note that "employers will tailor their compensation packages to suit the preferences of the workers they are trying to attract."[54] Van Boening, et al.'s model allows the employer to offer a menu of choices and the employees to choose which options suit them. This theory goes on to suggest that the mere presence of a choice is itself a benefit and that a "flexible benefits package may be strongly preferred to a pre-defined benefits package."[55]

The model does not suggest what these benefits should be. Rather, it is up to the employer to tailor offerings to suit target employees. The literature suggests the benefits' respective values will differ between

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[52] Van Boening et al., "Benefit Packages," 521.

[53] Van Boening et al., "Benefit Packages," 522.

[54] Ronald G. Ehrenberg and Robert S. Smith, *Modern Labor Economics Theory and Public Policy*, 10th ed. (New York: Addison-Wesley, 2008), 269.

[55] Van Boening et al., "Benefit Packages," 523.

individuals. This seems to be a reasonable assumption and the model allows for this by varying the treatment variables and providing choices between the cell values in a substantial range.

Because most subjects chose to play the game and exceeded the fixed payoff value, the results demonstrate that a flexible benefits package will increase employee job satisfaction. This will aid employers in retention and possibly attract a larger applicant pool from which to draw. The Navy could benefit from such a plan. This is based on the following conclusions from this study:

1. People value having choice almost as much as the choices themselves.[56]

2. People achieve a higher payoff when the fixed payoff is relatively high, but less valuable than the flexible plan's payoff. This suggests that employers should offer a fixed plan with comparable, but less valuable offerings, in addition to the flexible plan.[57]

3. Most people are willing to exert the mental effort to exceed the no-effort reward -- even if the easy (fixed) payoff is 80% of the possible complex-effort payoff.

4. People can easily handle this complex decision making task. The subjects, however, were college students. To determine applicability to the Navy

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[56] Van Boening et al., "Benefit Packages," 523.
[57] Van Boening et al., "Benefit Packages," 523.

enlisted community and to determine if there are significant differences, a similar experiment should be run on high-school graduates, non-high-school graduates, and alternative degree holders.

C.   IDENTIFYING THE BEST NON-MONETARY INCENTIVE OFFERINGS

The Denmond et al., thesis was the starting point for determining which incentives to include in the Enlisted Retention Survey and the subsequent simulated retention auctions. Their results showed the top non-monetary compensation attracters for Surface Warfare Officers to be: increased graduate education opportunities, guaranteed base housing, geographic stability, leave sabbatical, telecommuting, and additional money for dependents (education and daycare). These incentives were adjusted to reflect enlisted Sailor attributes, such as tour length and educational achievement, and served as the template for the survey used in this research. Similarly, the original Surface Warfare Officer Retention Survey was modified and expanded to suit the Enlisted Community's distinct needs.

Several previous Navy retention and benefits studies were analyzed and additional incentives, such as shipboard berthing options, lump-sum SRB payments, transferability of GI Bill benefits, and professional certification program were added to the survey and model.

1.   Results of Previous Conjoint Analysis

The Center for Naval Analysis (CNA) conducted a Choice-Based Conjoint survey to determine "[w]hich [Quality of Service (QOS)] factors are most important to the fleet's

Sailors and how do these QOS factors compare with pay in terms of their power to keep people satisfied and in the Navy?"[58] They specifically wanted to determine:

1. What are Sailors' preferences?

2. What is the strength of those preferences?

3. What tradeoffs do sailors make between pay and non-pay factors when making reenlistment decisions?

"In analysis of the [survey] data, the relevant constraint is the Navy budget. Specifically, the Navy is looking for information that will help to identify the most valued and potentially most cost-effective QOS programs among a variety of possibilities."[59]

This study did not measure the absolute value of present and potential compensation components. Rather, it measured the relative value of these components as compared to the increases in pay required to achieve comparable results.

"The survey results indicate that, even with several measures of pay included in the survey, non-pay factors play a substantial, measurable role in guiding Sailors' reenlistment intentions. More specifically, the two highest impact QOS improvements are location and duty-type assignment guarantees. These non-pay factors had pay-equivalent values of 5.7 and 4.3[%], respectively,

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[58] Amanda B. N. Kraus, Diana S. Lien, and Bryan K. Orme, *The Navy Survey on Reenlistment and Quality of Service: Using Choice-Based Conjoint To Quantify Relative Preferences for Pay and Nonpay Aspects of Naval Service*, CNA Research Memorandum D0008416.A2 (Alexandria, Virginia: Center for Naval Analysis, 2003), 11.

[59] Kraus et al., Choice-Based Conjoint Survey, 13.

indicating that Sailors value these guarantees as much as pay increases in the range of 4 to 6[%]."[60]

Other non-monetary incentives that had a significant positive value when compared to monetary offerings were guaranteed time for voluntary education and increased shipboard living space. Requiring Sailors to live onboard a ship while in port had the largest overall effect -- significantly negative. If this requirement were reinstituted, the study found that a 12.5% increase in basic pay would be required to maintain current reenlistment rates.[61] The CNA study did not include many of the benefits included in this thesis's survey, such as leave sabbatical, telecommuting, compressed workweek, and transferability of GI Bill benefits.

2.   The "Mix"

Military Compensation Reform in the Department of the Navy[62] summarizes the Department of the Navy's Human Capital Strategy and Guiding Principles as issued by the Assistant Secretary of the Navy, Manpower, and Reserve Affairs (ASN (M&RA)).

The seven strategic "objectives for creating a well performing, efficient, balanced, and effective human capital system ….are to (1) inspire, (2) develop, (3)

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[60] Kraus et al., Choice-Based Conjoint Survey, 3.

[61] Kraus et al., Choice-Based Conjoint Survey, 62.

[62] Michael L. Hansen and Martha E. Koopman, *Military Compensation Reform in the Department of the Navy*, CNA Research Memorandum D00012889.A2 (Alexandria, Virginia: Center for Naval Analysis, 2005).

compensate, (4) recruit and access, (5) manage, (6) shape the force, and (7) separate or retire ….through [seven] goals:"[63]

- *Recruit* the proper number of high quality people with the skills required for the terms of service needed.

- *Retain* the proper number of high-performing personnel with the right skills and experience for the terms of service needed.

- *Inspire Attainment of the Highest Standards of Performance (Attain High Performance)*, including motivating high levels of individual and collective performance, productivity, and contributions needed for the naval Services to successfully accomplish their missions.

- *Reward Exceptional Performance* through appropriate means, both monetary and nonmonetary.

- *Assign* the best people, with the required skills and experience, to perform the needed work, where and when needed

- *Motivate Professional Development (Motivate Development)* that fosters a culture of professional interest and growth so that people willingly acquire and use the skills, knowledge, and abilities required for specific jobs.

- *Facilitate Career Transitions (Facilitate Transitions)* at appropriate times between active, reserve, civilian, retired, and volunteer status in response to workforce requirements. The compensation system should allow and encourage people to pursue rewarding work/life opportunities throughout their careers.[64]

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[63] Hansen and Koopman, *Military Compensation Reform*, 8-10.

[64] Hansen and Koopman, *Military Compensation Reform*, 8-10.

The Guiding Principles that help decision-makers support these objectives are to ensure that programs and policies are:

- *All Volunteer*: The Department's compensation policies support an all-volunteer workforce; members perceive their compensation as 'fair and equitable'.

- *Flexible, Responsive (Flexible)*: The Department must be able to quickly and effectively change compensation policies to respond to changing market conditions and Service requirements ….

- *Strategic Best Value (Best Value)*: The Department's compensation policies must be aligned with other elements of their larger human capital strategy to produce the highest value, maximizing contribution, and minimizing cost ….

- *Support Achievement of Strategic Objectives and Outcomes (Support Objectives)*: Rational Compensation Policies support a hierarchy of strategic objectives and outcomes for successfully competing for talent and rewarding performance and recognizing contribution to mission.[65]

The study evaluates the Navy's current major compensation tools and how well they follow the four principles and satisfy the seven objectives. Hansen and Koopman demonstrate that there is not a single compensation tool available to the Navy at this time that satisfies all objectives. Most of the compensation tools do not fulfill half of the goals and adhere weakly -- if at all -- to the guiding principles. Figure 9 shows the scorecard for Retirement Pay, which is the worst-performing compensation

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[65] Hansen and Koopman, *Military Compensation Reform*, 10.

tool. Figure 10 shows the scorecard for Basic Pay, which is, not surprisingly, the best-performing tool.

Goals		Principles	
Retirement Pay			
Recruit	No: overall a large portion of pay, but too heavily discounted for new recruits.	**All Volunteer**	Yes.
Retain	Incorrectly: drives across-the-board retention and transition patterns for YOS1-30 years	**Flexible**	No: doesn't support variable career lengths, innovative career paths, exit and entry.
Attain High Performance		**Best Value**	No: can't target force management element by service skill, time, etc.
Reward Exceptional Performance		**Support Objectives**	
Assign			
Motivate Development			
Facilitate Transitions	Incorrectly: drives across-the-board retention and transition patterns for YOS1-30 years		

Figure 9.   Retirement Incentive Scorecard (*After Military Compensation Reform*)[66]

After analyzing the current tools available to the Navy, they suggest a flexible (or cafeteria) plan: "if the employer can provide in-kind benefits in a way that allows people to retain some decision-making authority over their consumption choices, the value of the in-kind benefits will be higher. This is the motivation behind cafeteria or *Flexible* benefit plans, which are becoming more prevalent with private-sector employers."[67]

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[66] Hansen and Koopman, *Military Compensation Reform*, App. C.

[67] Hansen and Koopman, *Military Compensation Reform*, 79.

Goals		Principles	
		Basic Pay	
Recruit	Yes.	**All Volunteer**	Yes.
Retain	Yes: especially at first reenlistment.	**Flexible**	No: Congress can adjust levels but cannot vary by service or occupation.
Attain High Performance	Somewhat: depends on the increase in basic pay associated with promotion and length of service.	**Best Value**	Weakly: Not targeted, but better than benefits.
Reward Exceptional Performance		**Support Objectives**	Yes.
Assign			
Motivate Development			
Facilitate Transitions	Weakly: by flattening out at higher YOS.		

Figure 10.   Basic Pay Scorecard (After Military Compensation Reform)[68]

They further suggest that "[o]nce an optimal mix of cash and in-kind benefits is determined … as much choice as possible should be offered among different benefits (e.g., cafeteria plans). In this way, the DON's benefit package will best align its guiding principles of being *Flexible* and *Best Value* while *Supporting the Objectives* often met through noncash compensation."[69]

Their final recommendation includes a quality-based compensation plan, which will not be addressed in this research. The focus of the Combinatorial Retention Auction Mechanism (CRAM) is cost-effectiveness while maintaining current quality. The current system of evaluations and retention recommendations is sufficient to maintain

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[68] Hansen and Koopman, *Military Compensation Reform*, App. C.

[69] Hansen and Koopman, *Military Compensation Reform*, 72.

acceptable levels of quality. Providing a compensation
system tailored to individual needs and desires will retain
those most willing to serve.

Based on the criterion set forth by Hansen and
Koopman, the CRAM model proposed in this paper could have a
scorecard similar to Figure 11.

Goals		Principles	
Combinatorial retention Auction Mechanism			
Recruit	Yes: individuals who place a high value on non-monetary compensation will be most interested in the Navy	**All Volunteer**	Yes.
Retain	Yes: individuals who place a high value on non-monetary compensation will be most interested in the Navy	**Flexible**	Yes: Memebers would choose the benefits they desire most. Would require flexible budgeting of SRB allocation.
Attain High Performance	Somewhat: individuals who obtain critical/technical skills will be highly rewarded. Must be retention eligible. However, higher rank often coincides with lower SRB.	**Best Value**	Yes. By substituting cash payments for non-monetary benefits and allocating those Incentives only to those who value them more than they cost.
Reward Exceptional Performance	No.	**Support Objectives**	Yes.
Assign	No.		
Motivate Development	Somewhat: individuals who obtain critical/technical skills will be highly rewarded.		
Facilitate Transitions	Possible: if sabbatical, on/off ramps offered as incentives.		

Figure 11. Projected CRAM Scorecard (After Military
Compensation Reform)[70]

The CRAM Model will address the strategic goals of
Recruit and *Retain* by showcasing the abundance and variety
of benefits available to service members. It will be a
highly *Flexible* and responsive tool that will adjust easily
and readily to changing labor supply and demand conditions.
It will provide strategic *Best Value* to the Navy by

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[70] Hansen and Koopman, *Military Compensation Reform*, App. C.

ensuring considerable Sailor value while also being more
cost effective than the current compensation policies.

IV. ENLISTED RETENTION SURVEY

To test the hypothesis -- offering non-monetary incentives in a total rewards, flexible benefits package would be the most efficient method of achieving the Navy's retention objectives -- it was necessary to determine the value Enlisted Sailors placed on those incentives. To determine these values, a survey was designed and administered to approximately 6,000 Sailors throughout the fleet.

One of the biggest challenges in statistical analysis is determining the sample. To mitigate variables such as first term obligation length, training intensity and length, minimum recruiting criterion, civilian opportunities, and SRB levels, the researchers chose to concentrate on two Navy enlisted ratings rather than the entire enlisted population.

A. TARGET POPULATION AND METHODS OF CONTACT

The Air Traffic Controller (AC) and Fire Controlman AEGIS (FC AEGIS) ratings were selected by the research sponsor based on each community's size and retention challenges. The Department of the Navy indentified these ratings as two of the twenty "most undermanned critical skills."[71]

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[71] U.S. Department of the Navy, *Department of the Navy Fiscal Year (FY) 2009 Budget Estimates Submission: Justification of Estimates, February 2008, Military Personnel,* Navy (Washington, D.C.: Government Printing Office, 2008), 85. http://www.finance.hq.navy.mil/FMB/09PRES/MPN_Book.pdf (accessed: November 6, 2008).

Unfortunately, Naval Personnel Command (NPC) was only able to provide approximately 50% of the email addresses for personnel with those ratings. To ensure maximum contact, approximately 150 Command Master Chiefs were sent emails requesting they forward the survey invitation (below) to their respective Petty Officers First Class (E-6) and below ACs and FCs (AEGIS and non-AEGIS):

> Subj: Survey Invitation from the Naval Postgraduate School
>
> INVITATION TO PARTICIPATE:
>
> You are cordially invited to participate in the Naval Postgraduate School's Non-Monetary Retention Incentives Survey. This survey will allow you to give us important feedback regarding non-monetary benefits such as geographic stability, telecommuting, compressed workweek or guaranteed homeport as well as an opportunity for you to give "write-in" suggestions. The survey's main focus is to assess how much you would value the included non-monetary benefits if they were offered as a part of your reenlistment package.
>
> If you receive this invitation from more than one source, we apologize. We are sending these invitations through multiple avenues to ensure everyone gets a voice! Please only take the survey once. Thank you in advance for your participation!
>
> Survey closes 11 Jul 08. Please click on link: http://www.surveymk.com/s.aspx?sm=m3GQ9plp63OmH52 DN8N0Bg_3d_3d

The survey was available via www.surveymonkey.com from June 24, 2008, until July 11, 2008. The entire survey is included in Appendix A. It is no longer available online.

To ensure complete coverage, potential subjects were also contacted via available individual email addresses.

B.   RATING INFORMATION

The following sections will give a brief overview of the two ratings and demographic information for each rating's population and sample.

Naval Personnel Command provided the following information about the AC and FC ratings:

1.   Air Traffic Controller

Navy Air Traffic Controllers (AC) perform duties similar to civilian air traffic controllers and play a key role in the effective use of Naval airpower throughout the world in operational and training environments. Navy ACs are responsible for safely and effectively directing aircraft operating from airfields or the decks of aircraft carriers. They also control the movement of aircraft and vehicles on airfield taxiways and issue flight instructions to pilots by radio. Standards for entry into the AC field are high, but once accepted into the field, Navy ACs enjoy a demanding and highly rewarding career. This is a five-year enlistment program.[72]

2.   Fire Controlman

Only two Navy job specialties, called "ratings," are included in the Advanced Electronics / Computer Field: Electronics Technician (ET) and Fire Controlman (FC). The rating in which an Advanced Electronics / Computer Field candidate is trained is determined in the initial phase of the Advanced Electronics Technical Core Course in Great Lakes, Ill. However, eligibility requirements are the same for both ratings in the Advanced Electronics / Computer Field.

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[72] Michael J. Otten, PERS 4011, email message to the author, November 18, 2008.

Jobs performed by … FCs are performed throughout the Navy's fleet of surface ships including aircraft carriers and Aegis cruisers, and at repair activities ashore….

FCs operate, maintain and repair the Fire Control Radars, mainframe computers, large screen displays, LANS, weapon control consoles, automatic gun systems and associated electro-mechanical systems utilized in weapons systems.

These ratings comprise the basis of the ship's Combat Systems department aboard ships and are responsible for maintaining the ship's readiness for combat operations.[73]

While the AC and FC ratings are vastly different in terms of duties and responsibilities, they are comparable with respect to initial obligation length, intensity of training, and quantity of civilian employment opportunities.

C.   POPULATION STATISTICS

There were 2,306 ACs at the time of the survey, 20.4% of which were female. There were 2,115 E-6 and below and 29.7% of the rating's billets were at sea. Of the 2038 FC AEGIS personnel, only 6.4% were female. There were 1,733 E-6 and below and 76.7% of the rating's billets were at sea. There were 4,032 Non-AEGIS FCs in the fleet of which 8.9% were female and 62.7% of these billets were at sea.[74] The AC and FC ratings provide an excellent contrast to each other in terms of the above demographic characteristics.

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[73] Earl Salter, BUPERS-322C, email message to the author, November, 6 2008.

[74] Edward Ferber, ETCM(SW/AW), email message to the author, July, 28 2008.

Due to the relatively small size and 15% expected response rate, the researchers chose to distribute the survey to the entire population (including non-AEGIS FCs).

Because of the second-hand nature of contacting the Sailors, a response rate was difficult to determine. Dependent on the number of sailors actually contacted, response estimates ranged from 8.6% to 11.5%.

Although the response rate was relatively low[75], there was a fairly representative sample. Table 1 shows a comparison of the population versus the sample in key demographics. Hispanics were considerably over-represented in the FC (AEGIS) rating. Air Traffic Controller was under-represented at sea and Fire Controlman was over-represented.

Table 1.   Population and Sample Statistics

	AC		FC(non-AEGIS)		FC(AEGIS)	
	Population	Sample	Population	Sample	Population	Sample
Female	20.81%	21.62%	8.93%	11.76%	7.50%	11.80%
Black	23.59%	22.27%	10.97%	8.11%	11.45%	12.57%
Hispanic	15.62%	9.55%	1.36%	5.95%	10.62%	10.18%
Under 27	59.66%	57.14%	48.45%	58.82%	46.13%	54.80%
28-42	37.96%	42.38%	47.73%	39.57%	49.83%	42.94%
Over 42	2.38%	0.48%	4.27%	1.60%	4.34%	2.26%
E6 & below	92.11%	97.76%	82.49%	96.79%	85.39%	95.51%
E-5	37.20%	41.70%	34.76%	54.55%	40.43%	51.12%
E-4 & below	30.35%	19.28%	24.39%	17.11%	14.52%	11.80%
At sea	29.29%	19.00%	62.72%	98.26%	72.54%	90.51%

1. FC(NON-AEGIS) significantly under-represented (Hispanic)
2. Due to targeting of E-6 and below, under-representation expected
3. AC under-represented and FC over-represented (at sea)

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[75] Kraus et al., *Choice-Based Conjoint Survey*, 31.

In the sample, the extremely low percentage of age 42 and above reflects the specific targeting of E-6 and below Sailors.

D.   RESULTS

1.   Distribution of Non-Monetary Incentive Values

There were 688 completed surveys. Only 604, however, were usable. The deleted observations were missing crucial data (i.e., reservation values). It was not possible to infer this data from the other available information. Derived numbers were contained in 17 observations.[76]

Table 2 lists the average reservation values for a purely monetary reenlistment bonus and the dollar amount of that bonus the respondents would be willing to give up in exchange for a particular incentive. The values in column 1 include outliers (initial values in excess of $500,000[77]) and currently infeasible amounts (in excess of $150,000[78]). Column 2 excludes outliers and Column 3 excludes infeasible

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[76] Of these individuals, 15 indicated that they would reenlist for free (no SRB). They proceeded, however, to indicate a willingness to pay (WTP) a percentage of their SRB for the non-monetary incentives listed. We inferred that they were aware of their eligibility for an SRB and were basing their WTP percentages on this amount. SRB amounts, for calculation of WTP only, were derived from demographic information provided. The Navy's online SRB calculator (https://staynavytools.bol.navy.mil/SRB/Default.aspx) was used. SRB amounts for these individuals were entered as zero. The remaining 2 individuals indicated that they would require the "current SRB" to reenlist. Their SRB amounts were derived using the above link.

[77] Values above $500,000 seemed to indicate that no amount of money would entice the respondent to reenlist. There were only three responses in this category: $500,000, $1,000,000, and $10,000,000. These observations significantly skew the summary statistics and are considered true outliers.

[78] Although current maximum SRB amount can not exceed $90,000 (OPNAVINST 1160.8A), the researchers chose $150,000 as a maximum feasibility level to ensure future viability of this analysis.

requirements. All usable responses, except one,[79] were
included in the thesis simulations.

Table 2.   Average Reservation Values for Respondents

	All Usable Responses	Outliers Excluded	Outliers and Infeasible Excluded
Number of Observations	603	600	592
SRB Required	$66,779	$47,978	$45,539
Homeport	6,498	6,358	6,302
Platform	11,477	2,563	2,594
Billet	14,039	5,357	5,358
One Year Sabbatical	4,706	4,731	4,772
Telecommuting	6,711	5,862	5,730
Geographic Stability (2 tours)	4,609	4,633	4,592
Geographic Stability (3 tours)	6,763	6,620	6,707
Professional Certification	3,608	3,627	3,579
Compressed Work Week	3,289	3,307	3,309
Transferrability of GI Bill	6,778	6,814	6,901
Single Barracks Room on Sea Duty	628	631	641
BAH on Sea Duty	1,433	1,440	1,443
Lump Sum SRB	4,400	4,424	4,441

    With the exception of one value entry, all Willingness
to Pay (WTP) values were less than the stated SRB
requirements. This indicates some consistency in
reporting. Combined incentive values were less consistent.
The value of two or more incentives in combination
sometimes exceeded the sum of the individual values. This
indicates complementarities between or among the combined
incentives. Often, the value of two or more incentives in
combination exceeded the highest individual value, but did

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[79] Respondent 623144606's responses were deleted. The Sailor's SRB
requirement ($10,000,000) and two NMI values ($5,000,000 each)
significantly skewed results.

not equal the sum of the individual incentives. This
indicates a possible diminishing marginal value to each
additional non-monetary incentive or a substitution effect
between or among the incentives within the combination.

In approximately 30% of the responses, the reported
value of two or more incentives in combination was below
the value of the most highly valued individual incentive in
that combination. While unusual, there are many reasons
why such reported combination values may have occurred.
There may have been a significant negative interaction
among the incentives included in the combination. For
example, a Sailor might have been interested in
telecommuting or a compressed workweek separately, but
perhaps his particular situation made telecommuting within
a compressed work schedule particularly unappealing. More
simply, perhaps the respondent just forgot how he had
valued the incentives in previous questions or the
respondent grew tired and rushed through those final
questions. Chapter VI discusses how such unusual responses
were addressed.

Using the mean to determine central tendencies can be
misleading in non-normal distributions. Many of the value
distributions for the non-monetary incentives have large
clusters at zero dollars, smaller clusters at certain
"focal" values, and long right-hand tails with few high
values. This is shown in Figure 12.
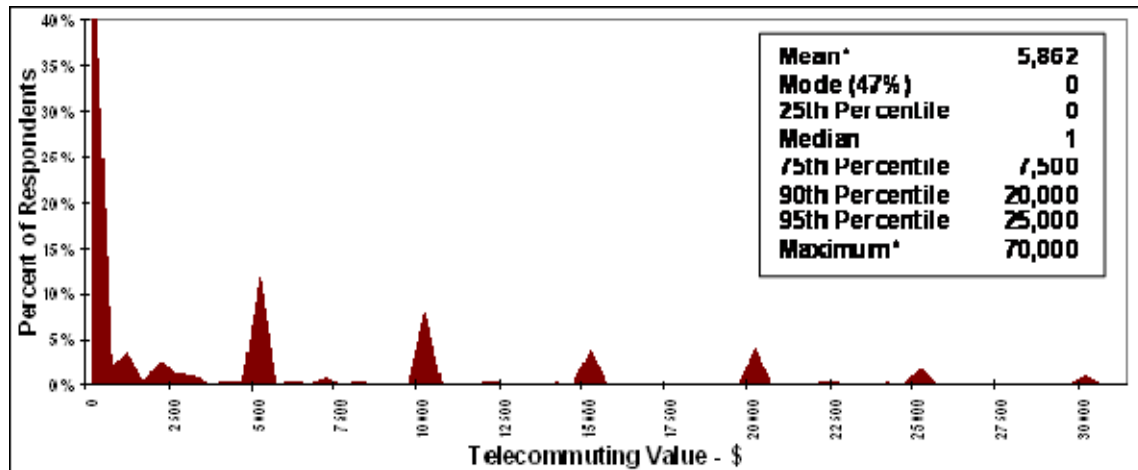
Figure 12.   Value Distribution for Telecommuting

Because of this asymmetric distribution of values, simply reporting means and standard deviations does a poor job of describing the distribution of values associated with any particular non-monetary incentive. Consequently, Table 3 displays the 10th, 25th, 50th, 75th, and 90th percentile values to more accurately describe the value distribution for each incentive. It is additionally advantageous to describe the distributions of values this way because the simulations, which this thesis will describe later, used different percentiles of the value distributions to estimate costs.

Although there is no validated costing data, many of these incentives could reasonably be available at a cost below the 75th percentile of the value distributions.

Appendix B contains value distribution figures for all Non-Monetary Incentives considered in the survey.

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Table 3.   Reservation Value Percentiles

	Percentile				
	10th	25th	50th	75th	90th
SRB Required	$10,000	$25,000	$45,000	$70,000	$89,000
Homeport	0	0	5,000	10,000	20,000
Platform	0	0	0	2,136	10,000
Billet	0	0	2,000	10,000	15,000
One Year Sabbatical	0	0	0	5,000	15,000
Telecommuting	0	0	1	7,500	20,000
Geographic Stability (2 tours)	0	0	0	5,000	12,800
Geographic Stability (3 tours)	0	0	1,000	10,000	20,000
Professional Certification	0	0	0	5,000	10,000
Compressed Work Week	0	0	0	5,000	10,000
Transferrability of GI Bill	0	0	1,000	10,000	20,000
Single Barracks Room on Sea Duty	0	0	0	0	500
BAH on Sea Duty	0	0	0	0	5,000
Lump Sum SRB	0	0	0	5,000	10,000

It is also relevant to note that there were 54
reported NMI values that were not usable. This is because
it was not possible to infer values based on the
respondents' answers. For example, "this would never
happen" may imply that the respondent values the option,
but doesn't believe it is feasible. Some respondents put
actual choices, such as "San Diego" for the homeport
option, but failed to indicate a dollar amount. Again,
this implies some value but not a specific amount. These
values were assumed to be zero to include the respondent's
other choices. There may be, however, some minor bias
introduced into the model due to these discrepancies.

Note, however, that any bias introduced by assigning a
zero value to these answers works in favor of the strictly

monetary retention incentives. Further, it works against
the two non-monetary incentive options examined in this
study (the universal incentive package and the
combinatorial retention auction mechanism). Thus, the cost
savings calculated in this study actually understates the
true cost savings that could be achieved by effectively
incorporating non-monetary incentives into the Navy's
retention offers. Nonetheless, the ultimate impact of
assuming zero value for these answers is likely minor as
these 54 values account for less than .4% of the 13,869
reported NMI values. These 54 responses came from 26
different respondents or 3.8% of the sample.

2.   Reasons for Accepting or Rejecting the SRB

Respondents were asked the following open-
response question:

Question 3: What was/will be your primary reason
for   accepting/declining   the   Selective
Reenlistment Bonus (SRB), if offered?

A. Reason for Accepting _____.

B. Reason for Declining _____.

The responses ranged from insightful, well articulated
ideas to frustration over policies and perceptions. Most
respondents did not include a dollar figure as part of
their answer. There were, however, categories of responses
that warrant further discussion.

a.   Reasons for Accepting the SRB

Figure 13 summarizes the distribution of the most
common categories of reasons for accepting the SRB.
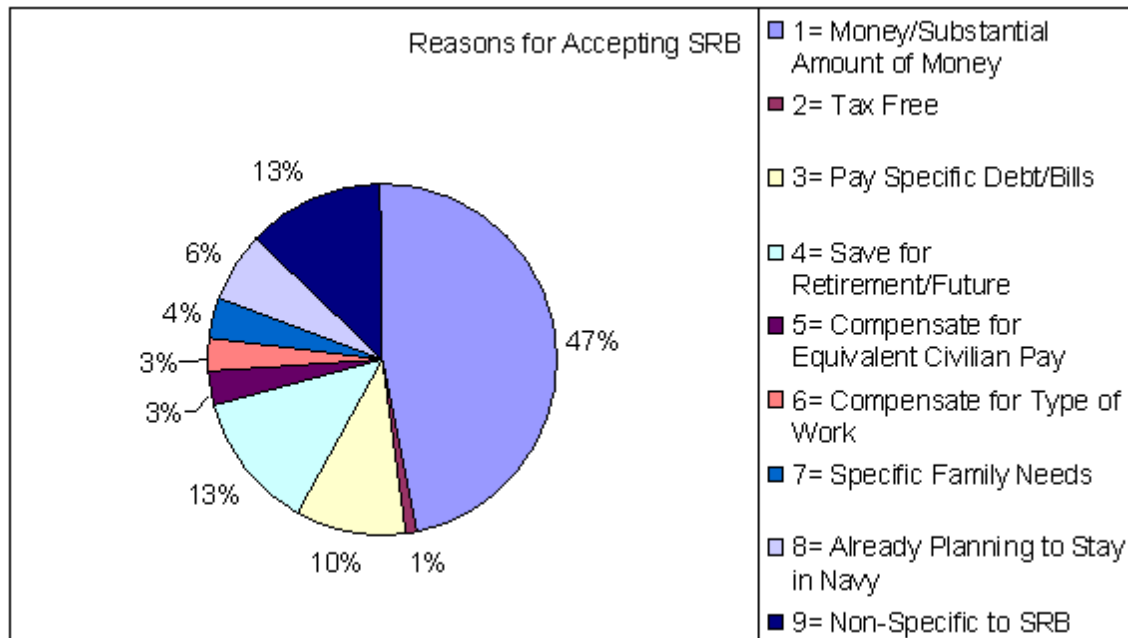
Figure 13.   Reasons for Accepting the SRB

"The Money"

Almost half (47%) of those who answered indicated
that "money," or the size of the bonus, was their primary
reason for accepting the SRB. The tone, however, of these
responses suggests that there may have been other factors
that influenced this decision, but the question wording was
unclear. For example, respondent 623952540 states, "I
don't know why I wouldn't accept it. It's one of the
reasons I would be reenlisting." Many also included a non-
monetary reason, such as respondent 622991201 who noted,
"It was for 75,000 and I enjoy what I do," or respondent
621771622 who wrote, "The amount of money, but would also
like geographic location."

Other Cash-related Reasons

Almost 33% of the responses fell into the following categories: to pay a specific/debt or bills (9.9%); to save for the future/retirement (12.8%); to compensate for equivalent civilian pay (3.2%); to compensate for type of work performed (2.8%); and specific family needs (4.1%). While these reasons indicate the expected use of the bonus, many could feasibly be satisfied with non-monetary compensation.

For example, respondent 621185813 states, "[P]ay off bills quickly and maintaining health insurance and life insurance from the government." This indicates that the respondent intended to use the SRB to pay off bills in a timely manner but may have reenlisted for the medical and life insurance benefits.

"I love the Navy"

Just over 6% said they were planning to reenlist anyway and that the bonus was an added benefit. This indicates significant economic rent or surplus is being paid to these individuals as 57% of them are FCs who currently receive substantial SRBs. For example, respondent 622007241 "[W]as going to stay in anyway. Bonus was an extra incentive." Some did, however, indicate they believed the SRB kept them on par with their civilian counterparts. Respondent 623273057 stated, "I already love my job and this is incentive for me not to go to the civilian sector and make more money."

Other Reasons

Almost 13% of respondents indicated that their reasons for reenlisting were non-monetary. These covered a wide variety of reasons including medical, dental and retirement benefits, job stability, liking the Navy, enjoying one's job, duty location guarantee, shore duty, advancement opportunities, pride in service, and one individual indicated he was reenlisting for the opportunity to go to sea!

b.   Reasons for Declining the SRB

Figure 14 summarizes the distribution of the most common categories of reasons for declining the SRB.
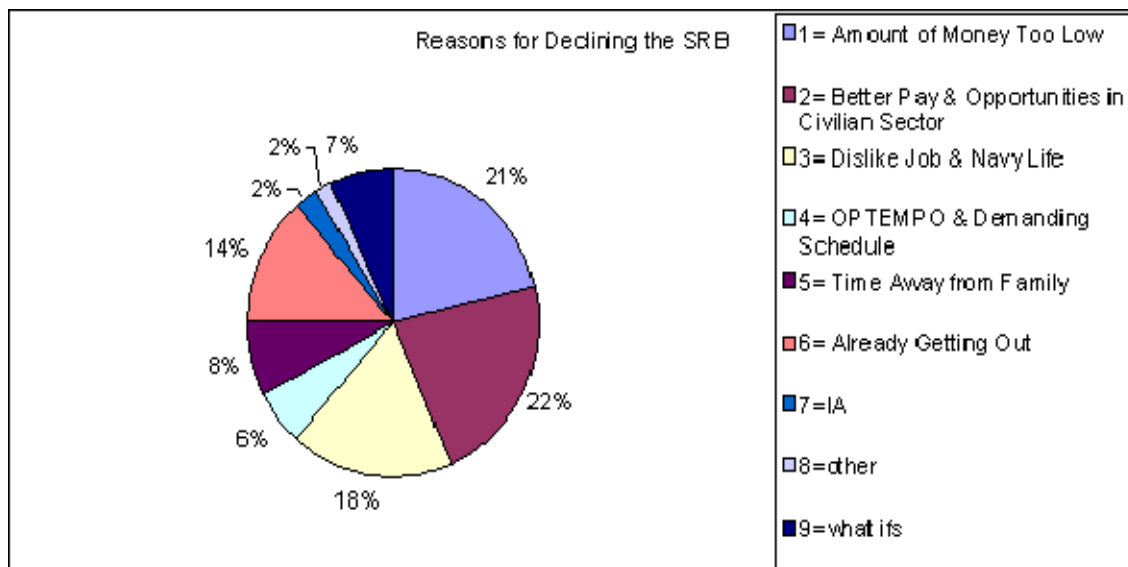
Figure 14.   Reasons for Declining the SRB

Civilian Opportunities

The most popular reason for declining the bonus was better opportunities or pay in the civilian sector. Of those who answered this way, 59% were FCs. This suggests

that there is still a perceived pay-gap beyond that which
the SRB attempts to compensate.

"The Money"

Only 21% of those who answered the question
indicated that they would not accept the SRB because the
amount was too low. Combining this group with those who
referenced better civilian opportunities or pay, as
described in "Civilian Opportunities," leaves 57% whose
reported reasons for not reenlisting were not directly
pecuniary. Therefore, these might be addressed via non-
monetary incentives.

"I don't like this place"

Just over 18% of respondents indicated they were
unhappy with aspects of their jobs or Navy life.
Respondent 621725008 states, "I do not enjoy military life.
Most of my time is not actually spent working with
electronics. I am a highly trained individual who spends
most of his time cleaning instead of troubleshooting the
weapon system." This same individual indicated that he
would accept the SRB because it "was a good amount of
money, the Navy has been good for me and my family." These
responses indicate that, for this individual, money is not
the primary driver for retention.

"I'm getting out"

Almost 14% of respondents gave no specific
reason, but indicated that they would not be reenlisting.
It is unclear from the results if some of these individuals
were unwilling or unable to reenlist because they simply
answered "I will not be reenlisting" or words to that

effect. Of those who meant they were unwilling due to some non-pecuniary compensation issues, perhaps these individuals could be retained through non-monetary incentives.

"What ifs"

Only 7% of respondents gave hypothetical situations in which they would not reenlist. For example, respondent 622066295 stated, "If at the time of re-enlistment, it is not worth staying in, in regards to family and personal time." Respondent 622046321 stated, "If I am selected for an enlisted to officer program." Others indicated if the amount was not enough, they would not reenlist, but did not specify that the current amount was too low. For example, "If I can't choose my orders and the sum is lower than I expected" (respondent 623904752).

OPTEMPO/PERSTEMPO

Dissatisfaction with sea/shore rotation, deployment schedules, and time away from family were primary reasons for 14% of respondents to decline the SRB. Almost 8% specifically stated time away from family as the primary reason. While high operations tempo (OPTEMPO) and subsequent family separation are necessities in the Navy, there may be an opportunity to retain these sailors if they believe they are not excessive. Respondent 623140885's statement reflects a common sentiment, "Due to cutbacks, ships are undermanned and that means even longer hours in port and less time with family."

3.   Respondent Retention Suggestions

Respondents were also asked to list any other non-monetary incentive(s) that the Navy could offer which would be attractive and the amount of bonus dollars that they would be willing to give up to receive that incentive.

Figure 15 summarizes the distribution of the most common response categories.
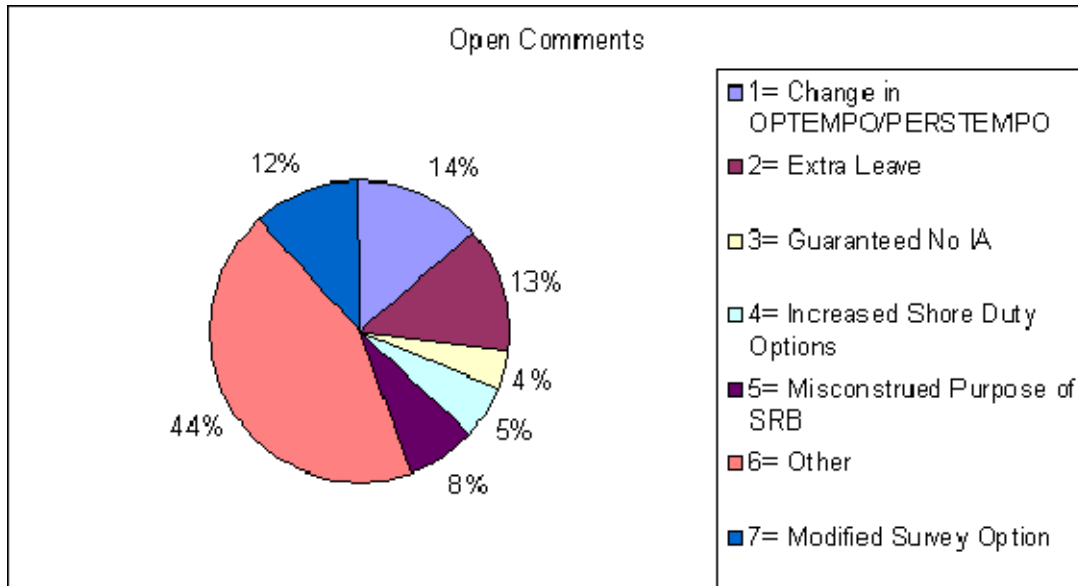
Figure 15.   Open Comments

Over half of the responses fit into one of six basic categories. The remaining 44% proposed changes to the promotion system, structuring of billets, retirement policy, education opportunities, and current leadership. For example, respondent 621267862 stated,

> Return the training commands to the military, who
> possess a clue about what is necessary to train
> Sailors rather than civilians who have no concept
> of shipboard life. Working knowledge of the gear
> is far more valuable than theory and experience
> on an actual platform surpasses a civilian's dry-

side knowledge. Open the billets for training
back up for the sailors who know the gear and how
it really acts. $45,000 (all).

Respondent 621303137 stated, "Retire at 10 years
service-$60,000. Automatic advancement-$40,000."

Respondent 621318214 suggested, "TAD orders set aside
for college and/or work toward college (9 mo/s - 1 year) -
$45000." This is an interesting twist to the sabbatical
idea and is similar to the former Enlisted Education
Advancement Program.

Respondent 621566154 gave multiple suggestions and
feedback on our survey options and also expressed
frustration with the current SRB policy:

> I believe you need to seriously modify the
> current plan installed now for SRB. There are
> Sailors at my command that have been in for 4
> years, do not have their Enlisted Surface Warfare
> Specialist Pin, do not have collateral duties,
> and are getting ready to reenlist for $75,000
> (tax free). Where is the logic in that? You are
> rewarding those who do nothing for you. I believe
> there should be a series of requirements to be
> able to receive amounts like this. As for your
> compressed work week, there is not enough time in
> the week now to get what we need done (I am a
> CIWS Tech) so I do not speak for all rates. Some
> of us do this [10-hr days] already 5/6 days a
> week and love our jobs. What kills our motivation
> is when the Navy gives and gives and gives to
> those who produce nothing. I am not a
> disgruntled Sailor and I plan on retiring. I did
> get $45,000 a few years ago when I reenlisted,
> but I worked extremely hard for it. I do enjoy
> my job and appreciate what the Navy had offered
> me. Unfortunately, I am seeing way too many
> first class and chief petty officers getting out
> with 10,14,16 years of service. And the reason
> is because the 'Navy is changing.' I do agree
> heavily on billet choice, geographic stability,

and transferring of the GI Bill. These are the
things we need to really consider. Making a
Sailor and his family happy are key to morale at
commands.

OPTEMPO/PERSTEMPO

Deployment schedule, sea/shore rotation, and time
away from family continued to be of primary concern to
these participants. 14% of those who answered gave a
suggestion to improve these areas. Respondent 621751867
stated:

> The main reason why I will not reenlist is due to
> the under-manning and increased demand while at
> sea. I have to do almost twice the amount of
> work with almost half the manning from when I was
> on my first ship. I am not impressed or
> convinced the new 'business model' for the Navy
> is effective. This is the military not a Fortune
> 500 company. I have little time to pursue
> personal goals while on active sea duty where
> FC's have to be. The new ship's schedules are
> non-stop. It is possible to take PACE and
> distance learning classes, but time and internet
> constraints make it difficult. If our sea/shore
> rotation could be altered to allow FC's more time
> on shore to allow degree pursuits, professional
> certifications and spend more time with family.
> More quality training facilities need to be
> utilized for our new Sailors. Computer-based
> learning is not as effective as having a seasoned
> technician teach. The possibility to do back-to-
> back shore would also be a good incentive. Give
> people time to finish up a degree, raise a child,
> or simply take a break from the rigors of sea
> duty.

Extra Leave

Just over 13% of the respondents indicated they
would like to purchase additional leave or liberty days in
lieu of part of their SRB. Many gave dollar amounts that

ranged from $250 per day to $10,000 for an increase to sixty days per year. These responses highlight another potential non-monetary incentive that is not currently being considered and has the potential to be a very cost effective option.[80]

Modifications to Survey Items

Just under 12% of respondents offered suggestions that were similar to our survey items, but with modifications. For example, some indicated they would be willing to forgo some of their SRB for 6 months to a year to finish their degree, but on active duty versus on a sabbatical. Respondent 621309181 stated:

> Guaranteed education benefits for reenlisting, i.e., - reenlist, and the Navy will give the s/m the option of 12 months of paid college benefits at the end of the tour (to count as shore duty) s/m could work a shift schedule at recruiting station or other duty station or evening/weekend schedule - with no cap on the amount of hours to be taken within 12 month cycle; this could be very attractive to individuals who would like a fleet sabbatical to improve their education - just a thought - bonus reduction of $7,500; designating parking would be an improvement - $1000; compressed work schedule - $1,000."

Purpose of SRB

A small, but significant, number of respondents seemed to misunderstand the purpose of the SRB. Perhaps, because it is called a "bonus," the perception is that it is some kind of reward for service.

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[80] Per-day salary is $180/day for a Sailor making $45,000 per year. This assumes 5 days per week, 50 weeks per year.

For example, respondent 622473320 stated, "[The] SRB for re-enlisting should be higher for those that have committed to doing a career in the Navy." The reality is the exact opposite: the SRB should be lower -- not higher -- for those who have committed to a Navy career. This is because these are the types of Sailors who do not need to be paid much of a bonus to induce reenlistment. Instead, higher bonuses should be paid (must be paid) to those Sailors most reluctant to commit to a career in the Navy.

Respondent 623843938 stated, "I realize there is rank in the military, but I often find it disheartening and laughable that I receive the same paycheck as a second class BM who scrapes paint all day." This individual is not factoring his SRB, that the Boatswains Mate (BM) does not receive, which significantly increases his wage above other sailors of the same rank. Career counselors and leading Chiefs should continue counseling Sailors on their entire compensation package to ensure they truly understand the benefits they are receiving.

Increased Shore Duty Options

Over 5% indicated they would like to have better shore duty options. Almost 70% of those were FCs. The biggest complaint was that FCs are limited to Recruit Training Command, recruiting duty, or instructor billets in Dahlgren, Virginia.

Individual Augmentation (IA)

Although only 4% of the open responses mentioned IAs, it was also stated in 2% of the responses as the primary reason for declining the SRB and, thus, deserves

discussion. Respondent 621567958 stated, "Shrink deployment times and get rid of IA requirements. We choose to join the Navy for many reasons, some of us love going to sea, patriotism, college money. However, I assure you, especially for those that have been in for more then 5 years, no one wanted and few a[re] willing to accept the challenge of a 6-18 month IA."

E.   SUMMARY

Although monetary compensation continues to be a significant motivator of retention, non-monetary aspects of military life are clearly important to these Enlisted Sailors. The survey produced evidence of dissatisfaction with current benefits distribution and offerings and potential retention benefits from the proposed non-monetary incentives offered in this research.

Although many of the value distributions for the non-monetary incentives have a large cluster at zero dollars, there are smaller clusters at certain substantial "focal" values. The tails include a few high values (some as high as 50,000 dollars or more). These distributions underscore the challenges of applying a "one-size-fits-all" compensation package in terms of Sailor satisfaction and cost-effectiveness and provide evidence to support tailored retention packages designed to maximize the benefit to each individual Sailor while minimizing the cost to the Navy.

V.   RETENTION MECHANISM ALTERNATIVES

A.   INTRODUCTION

As discussed in Chapter II, the current system of determining bonus levels is sub-optimal. Strength planners do not currently possess a tool that allows them to pinpoint the exact market clearing bonus level. The result is either retention deficits or surpluses.

Moreover, despite budgeting more than $350 million per year on retention incentives for enlisted personnel alone, the Navy has, in recent years, failed to meet a number of its retention goals. Thus, it is also important to evaluate whether an alternative retention mechanism, beyond the strictly monetary incentives currently employed, might more cost-effectively achieve the Navy's retention objectives.

This chapter introduces several alternative mechanisms for (1) identifying precisely which personnel should receive a retention or re-enlistment bonus and (2) determining the appropriate magnitude and composition of such a bonus. These mechanisms include alternatives which employ strictly monetary incentives as well as alternatives which incorporate non-monetary incentives into the retention bonus.

The next section describes mechanisms which utilize monetary incentives alone -- either employing a pre-determined cash bonus amount or a cash bonus amount determined via auction. The final two alternatives involve non-monetary incentives incorporated into a Total Rewards package. For example, the Universal Incentive Package (UIP) combines a common monetary incentive with a common

set of non-monetary incentives. Each is offered to all who
are selected for retention or reenlistment. The concluding
alternative is the Combinatorial Retention Auction
Mechanism (CRAM). This combines individualized monetary
incentives with packages of non-monetary incentives. These
are "customized" for each individual Sailor.

B.   MONETARY RETENTION INCENTIVES ALONE

The most straightforward approach to retention bonuses
is to only use monetary incentives. Determining the
appropriate magnitude of this monetary incentive, however,
can be problematic. Generally speaking, the amount of the
cash incentive can either be predetermined, using various
estimation techniques, or it can be determined endogenously
via auction or some other market mechanism.

1.   Predetermined Incentive Amount

As discussed in Chapter II, the size or amounts of the
Selected Reenlistment Bonuses are predetermined using
historical data combined with present economic conditions,
such as unemployment rate and civilian-military pay gap.
Unfortunately, as shown in Figure 16, this model is not a
perfect predictor and can result in under-manning (or
under-payment) in some ratings and over-manning (or over-
payment) in others.
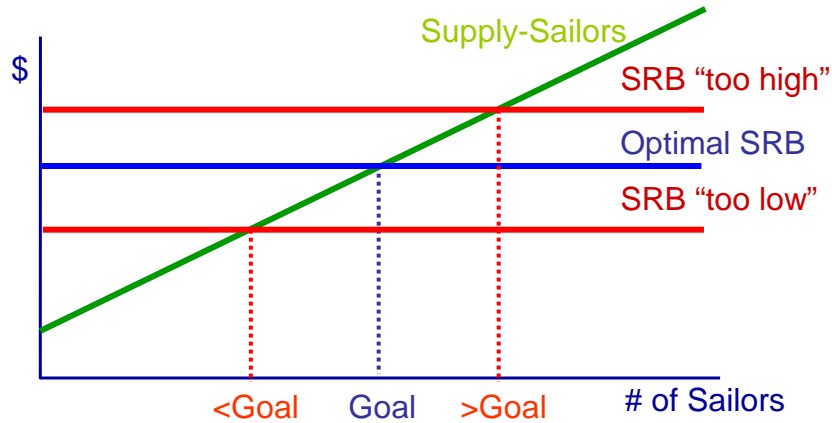
Figure 16.   Disadvantages of a Predetermined SRB Level

2.   Determined via Auction

A properly designed retention auction would inject accuracy into the SRB level setting process. Coughlan and Gates argue that retention auctions offer the promise of being:

1. Precise:
   a. Retain the precise number of service members desired.
   b. Identify which individual service members to retain.
2. Cost Effective:
   a. Endogenously determine minimum bonus necessary to achieve goals…
3. Voluntary:
   a. Pay each retained service member no less than amount requested in bid for retention.
   b. Exclude only those service members who requested more than (or at least as much as) amount paid to any retained service member.
4. Efficient:
   a. Retain service members most willing to continue service.[81]

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[81] Peter J. Coughlan, William R. Gates, and Brooke M. Zimmerman, "The Combinatorial Retention Auction Mechanism (CRAM): Creating Individualized Monetary & Non-monetary Incentive Packages," (presentation, Defence and Economics Security Workshop, Ottawa, Ontario, Canada, November 6, 2008).

A key question, however, is which type of auction would best suit the Navy?

a. *Open vs. Sealed-Bid Format*

By necessity, a Navy retention auction would be a reverse, multiple winner auction. The single buyer would be the Navy and the sellers (of their labor) would be the Sailors. NPC (the auctioneer) would pre-determine the number of winners within each rating (or NEC) based on end-strength/manning requirements and budget constraints.

The simplest and most understandable variation would be the first-price open bid auction. It is, however, not feasible to simultaneously assemble all eligible Sailors (even virtually) to accomplish a real-time auction. The alternative is a sealed bid auction. Therefore, a choice must be made between first and second-price determination.

b. *First-Price vs. Second-Price*

To compare the first-price vs. second-price auction formats in the retention context, there must be an understanding of the bidding strategies under each format.

The optimal bidding strategy for a first price SRB auction is to inflate one's bid above the true reservation value, or minimum willingness to accept (WTA), to maximize economic rent received. Sailors must balance this strategy with the increased likelihood of "losing" the auction by overbidding.

In particular, the optimal bidding strategy for a risk-neutral bidder in a first-price reverse auction is to

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bid his estimate of the lowest WTA amount among the losing bidders. More precisely, if *k* Sailors will be retained within a particular rating, the equilibrium bidding strategy is for each Sailor to bid what he expects to be the *k+1st* lowest WTA amount (conditional on the assumption that the bidder's WTA amount is among the lowest *k* WTA amounts).

To better understand this, note that the Sailors can expect that no Sailor will bid below his WTA amount. Thus, a Sailor is guaranteed to be one of the *k* "winners" in the auction so long as he bids below the *k+1st* lowest WTA amount among the Sailors bidding. Thus, each Sailor is trying to bid as high as he can (above his true WTA amount) and still be a winner.

It is not clear, however, that Sailors will possess the requisite information on other sailor WTA amounts to estimate the *k+1st* lowest WTA amount. In the best case, bids will simply be inflated somewhat arbitrarily. In the worst case, the "wrong" Sailors, those less willing, will be retained. To retain them in subsequent auctions will likely result in higher retention costs.

For a second-price *single-winner* auction, Chapter II demonstrated that truthful revelation is the only rational strategy. The same holds true – using a similar logic that will not be spelled out here – for second-price *multiple-winner* auctions. The problem with this type of auction is convincing less savvy participants that it is in their best interest to bid truthfully. Mandatory training

and practice auctions would be necessary to ensure personnel understand their optimal strategy.

c.   Cost Equivalence of Auction Types

With the bidding strategies under both the first-price and second-price retention auction articulated, it is important to note that the monetary cost of each type of auction is virtually equivalent. In all Enlisted Retention Auction formats, the Sailors who cost the Navy the least, or have the lowest willingness to accept (WTA), will be retained. If one assumes Sailors will not bid less than the minimum amount they would be willing-to-accept for retention, the only concern is with the possibility of over-bidding to maximize economic rent. In Figure 17, the red line represents the optimal first-price auction bids and the blue line represents second-price auction bids (in essence, these are the Sailors' true reservation values).
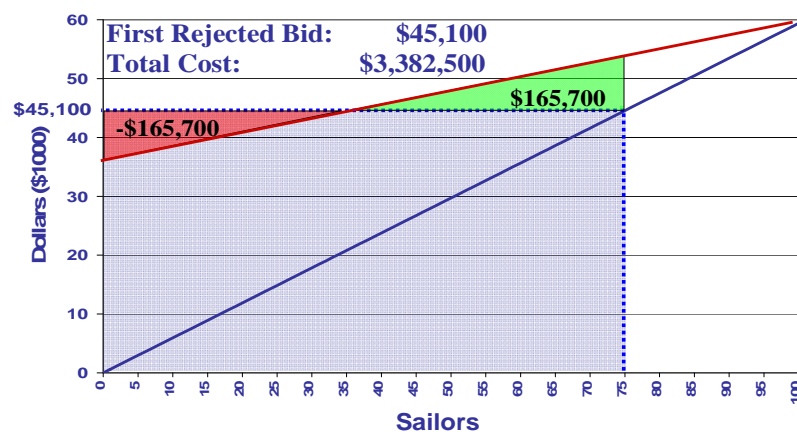
Figure 17.   Cost-Equivalence of First and Second-Price Auctions (*After* Coughlan et al., CRAM Presentation)[82]

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[82] Coughlan et al., CRAM presentation.

In the first price auction, the trade-off between risk of non-retention and the reward of economic rent determines the optimal strategy. A risk-neutral Sailor will bid what he assumes to be the lowest WTA amount among the losing bidders (conditional on his own WTA amount being among the winning WTA amounts). This results in an efficient mechanism: the Sailors who are most willing to remain on active duty are retained. Significant economic rent, however, is paid to those individuals who would have stayed for less. This is the distance between the red and blue line for each Sailor. Additionally, Sailors may have difficulty determining the proper bid. This may reduce the likelihood of retaining those most willing to remain in the service.[83]

In the second-price auction example in Figure 17, the 75 cheapest Sailors are retained for the price of the 76th Sailor's WTA -- in this example, $45,100, for a total cost of $3,382,500. The green triangle represents the Navy's reduction in bonus payments (to the highest WTA sailors retained) over the first price auction. The red triangle shows the Navy's increase in bonus payments (to the lowest WTA Sailors retained) over the first price auction. These two numbers cancel each other and the result is the equivalent cost to the Navy under both mechanisms. What is not clearly equivalent is Sailor value. This model assumes that Sailors will accurately predict their optimum bid and place it accordingly. Sailors who would be retained under their true reservation

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[83] Coughlan et al., CRAM presentation.

values might incorrectly estimate their place in the distribution. Thus, they may overbid in the first-price auction and not be retained.

3.   Second-Price Retention Auction Example

Suppose the Navy wishes to retain two out of three sailors who bid their true reservation values of $80,000, $90,000, and $100,000, respectively. Under the second price auction mechanism, Sailors 1 and 2 would be retained for $100,000 each for a total cost of $200,000. Sailor 1 would receive a surplus of $20,000 and Sailor 2's surplus would be $10,000. This example will be further developed in Section D.3 to include the Combinatorial Retention Auction Mechanism.

C.   UNIVERSAL INCENTIVE PACKAGE (UIP)

1.   Description and Purpose

The simplest way to incorporate non-monetary incentives (NMI) is to offer a "one-size-fits-all" package that combines a predetermined portfolio of NMIs coupled with a cash bonus. To reach retention goals more efficiently than with money alone, the cash payments must be reduced sufficiently to cover the cost of providing the NMIs. If the Sailors value these NMIs more than the Navy's cost to provide them, the total value delivered to Sailors exceeds the cost of delivery.

The participants would be offered a fixed package of incentives and would submit a cash (requirement) bid to supplement that package. The auction would then follow the same process as the monetary-only auction.

2.   Determining which Incentives to Include

The main difficulty when designing a Universal Package is determining which incentives to include. There will be a surplus to the Navy for NMIs where Sailor value exceeds cost and a deficit associated with NMIs where Sailor value is less than cost (see Figure 18).
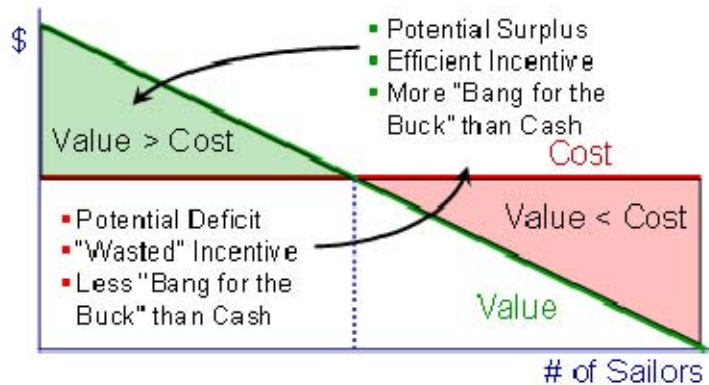
Figure 18.   Cost vs. Value of Non-Monetary Incentives (*After* Coughlan et al., CRAM Presentation)[84]

Since all who desire the incentive will receive it, there is potential for significant deficit to the Navy in offering incentives whose cost exceeds the majority of Sailor values. In Figure 19, if the demand curves shown represent valuations among retained sailors, it would be cost effective to offer choices a and b. This is because total Sailor value exceeds cost. Choices c and d, however, would result in a deficit. This is because total Sailor value is less than total cost.

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[84] Coughlan et al., CRAM presentation.
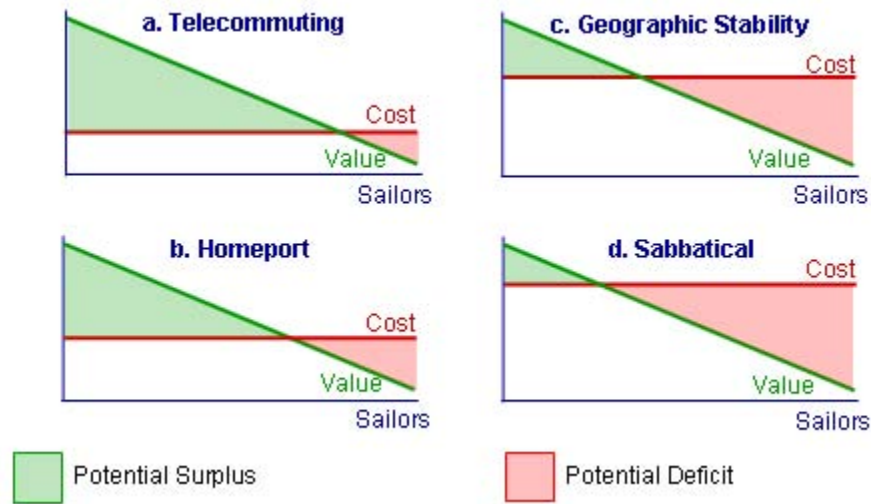
Figure 19.   Non-Monetary Incentives Portfolio (*After* Coughlan et al., CRAM Presentation)[85]

3.   Optimal Universal NMI Package

a.   *Description*

Providing an NMI as part of a retention bonus package reduces each Sailor's minimum cash retention bonus required by the value of that particular NMI to that particular Sailor. Including a particular NMI as part of the Universal Incentive Package will reduce total Navy retention costs only if the total surplus among retained Sailors (value – cost summed over all retained Sailors with value > cost) exceeds the total deficit (cost – value summed over all retained Sailors with value < cost) for that NMI. More directly, the optimal Universal Incentive Package for the Navy would only offer those incentives where the surplus exceeds the deficit (among retained Sailors).

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[85] Coughlan et al., CRAM presentation.

b. *Problem: Truthful Revelation*

At the time retention decisions (and potential auction bids) are made, the incentive package must already be determined. Thus, to construct the optimal Universal Incentive Package, planners must discover the value distribution of prospective incentives among prospective retained Sailors prior to the retention decision point. Sailors, unfortunately, would not have an incentive to truthfully reveal their NMI values prior to the retention decision point if they knew the NMI package information they provided would determine the package of NMIs that all Sailors would receive for free.

4. Including NMI based on Sailor Feedback

a. *Value More or Less than Cost*

A possible approach to the problem of identifying appropriate incentives to include in the UIP would be to publish the cost of the incentives and ask Sailors if they value said incentive as much or more than that cost. The problem with this approach is that respondents may inflate their values to ensure that an incentive will be offered.

b. *Relevant Population*

Furthermore, only the valuations among *retained* Sailors are appropriate for determining what incentives should be included in the universal package. The set of retained Sailors is the population that will determine if the NMI total value exceeds its total cost. Sailors not retained may have high values for some NMIs, but their values will not be realized if they are not retained.

Therefore, it would be difficult to know which Sailors to include in any poll of NMI values.

c.   Determining Usage Rate

The question still remains: At what level of Sailor value should NMIs be included in the package? As discussed, this answer depends on the value distribution of the retained Sailors as well as how many retained Sailors actually use the incentives. More extensive surveys are required to draw conclusions about the value distributions of Navy Sailors. All of the value distributions from the Enlisted Retention Survey, however, were heavily concentrated to the left (low values) with a large cluster of values at zero, but with a long tail to the right (high values). The Sabbatical example in Figure 20 has 59% of its values at zero, a skewness of 2.79, but a maximum value of $65,000. The median value is zero dollars.

For this sample, if the cost to provide a one-year sabbatical to a Sailor is $4,370, only 27.2% of the Sailors value the incentive more than its cost. If the Navy retained all of these Sailors and all received and used the Sabbatical option, the total NMI value (V_{NMI}) minus total NMI cost (C_{NMI}) would be a loss of $24 -- essentially the break-even point. For the sake of illustration, all Sailors are retained. In contrast, if the cost is just $70 less ($4,300), V_{NMI} - C_{NMI} would be a gain of $42,185. This is true even though the same percentage of individuals values it more than it costs. If the cost is $70 more ($4,440), the total V_{NMI} - C_{NMI} would be a *negative* $42,234.

Mean	4,706
Mode (59%)	0
25th Percentile	0
Median	0
75th Percentile	5,000
90th Percentile	15,000
95th Percentile	25,000
Maximum	65,000
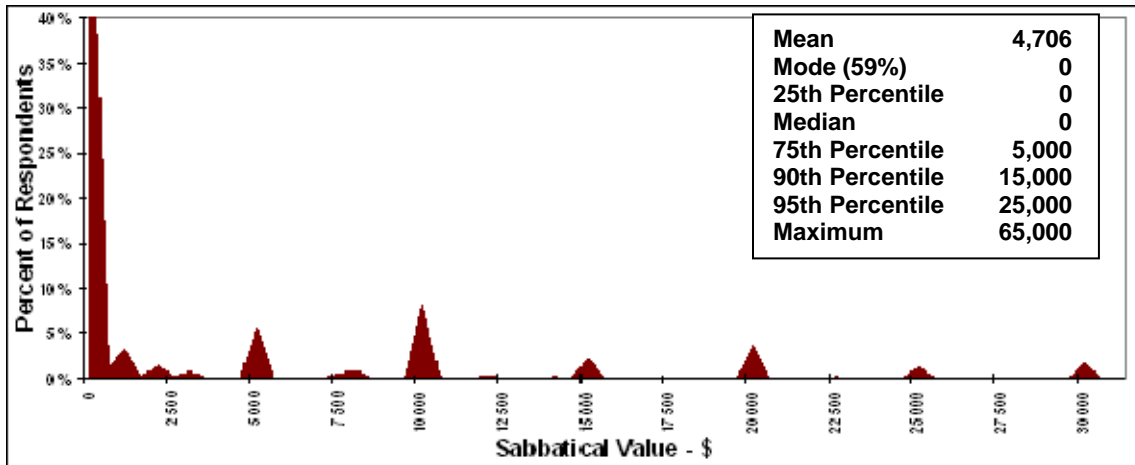
Figure 20. Value Distribution for One Year Sabbatical

The 75th percentile value for this value distribution is $5,000. If Sabbaticals cost the Navy $5000 with this sample, the Navy would save $1,615,085. That is, if it offered Sabbaticals in the NMI package and only those who placed positive value on it actually used it. This is probably not realistic: a Sailor may not be willing to forgo some of his bonus to receive a benefit, but he may use it if it is offered for free. For example, a single Sailor may not place a value on his commissary benefits, but he may occasionally use the facility. With this sample, the Navy would *lose* $379,914 by offering the one-year Sabbatical option under the $5,000 cost scenario if everyone (all 603 Sailors in the sample) used it. This clearly illustrates how crucial offerings determination is with the Universal package.

5.   Potential Benefits and Limitations

For the Universal Incentive Package to be cost-effective, it should include only those incentives where total Sailor Value exceeds total cost to provide. In the

optimally designed UIP, NMIs a and b in Figure 21 would be
included; NMIs c and d would not. This package design has
the potential to save the Navy money. This assumes that
Sailor values and likelihood of use can be accurately
predicted. Unfortunately, discovering these values and
probabilities can be problematic and the results could be
disastrous. The above example showed a net result of
offering Sabbatical ranging from a savings of $1.6 million
to a cost of approximately $379 thousand. This depended on
which Sailors actually used the benefit. Finally, the UIP
is not Pareto optimal, i.e., there is still room for
improvement. The potential benefits available by offering
incentives c and d in Figure 21 would not be realized with
UIP.
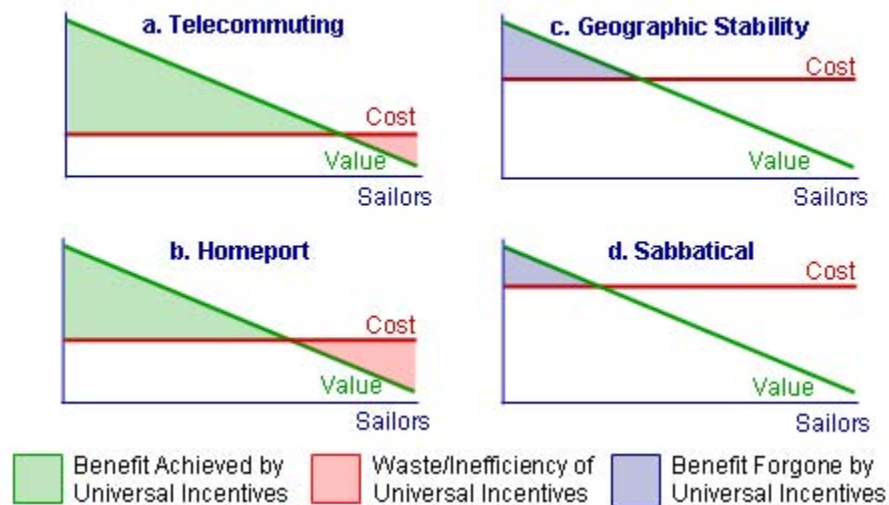
Figure 21.   Limitations of a Universal Incentive Package
        (*After* Coughlan et al., CRAM Presentation)[86]

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[86] Coughlan et al., CRAM presentation.

D.   COMBINATORIAL RETENTION AUCTION MECHANISM (CRAM)

1.   Overview

The CRAM incorporates three elements -- each serves a separate purpose:

(1) Second Price Auction provides accuracy in setting bonus level;

(2) Non-monetary incentives provide lower cost to retain Sailors with value > cost for those NMIs;

(3) Combinatorial auction provides individualized incentive packages with no "wasted" incentives.[87]

Under the CRAM, a retained Sailor receives a particular NMI only if he values the incentive more than it costs the Navy to provide. This eliminates the need to determine which incentives to offer. All incentives are offered to all Sailors and allocated to those whose value exceeds cost. For those non-monetary incentives whose cost varies significantly depending on the number of participants, there are a number of variations of the CRAM which can be adopted to accommodate such varying (presumably increasing) unit cost. This includes the use of equilibrium prices (where the supply or marginal cost curve intersects the demand or value curve), average costs or quantity limits (quotas) for each NMI.

2.   Process Description

The CRAM Auction is very similar to the auctions used for monetary retention and the Universal Incentive Package described above. Each Sailor bids the minimum SRB he would

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[87] Peter J. Coughlan, email message to the author, November 2, 2008.

require if the retention incentive was cash-only. For each non-monetary incentive, each Sailor also indicates the reduction in his cash bonus that would be acceptable if that non-monetary incentive were included in his retention package.

After receiving these bids, the auctioneer calculates the minimum cost package required to retain each Sailor. Each minimum cost package includes any NMI where the Sailor's value exceeds the Navy's cost. To calculate his provisional cash bonus, the Sailor's required cash-only bonus is reduced by the value he placed on the NMI(s) in his initial bid. The Navy's total cost of those incentives is then added to the provisional cash bonus to derive the Sailor's effective cost to the Navy -- or the Navy's total cost of the package bid.

Once each Sailor's minimum cost package bid is calculated, the set of lowest cost Sailors is retained. Each retained Sailor receives the NMIs included in his individualized package plus a cash bonus that is equal to the cost of the first excluded package bid minus the cost of his set of incentives. Note that each Sailor receives a retention package of the same total cost to the Navy.

Because each Sailor has different NMI packages and values, the value of the retention incentive will vary across Sailors. Every Sailor, however, will receive value that equals or exceeds the Navy's cost. In some cases, a Sailor's value may significantly exceed the Navy's cost.[88]

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[88] Coughlan et al., CRAM Presentation.

3.   Process Example

The example in Figure 22 continues the example from section B.3 above. In this example, three Sailors bid their minimum required cash-only SRB (truthfully, given that this is a generalized second-price auction) and each states the dollar amount of that bonus he would sacrifice for each of the 2 available NMIs. The cost to provide each NMIs is assumed to be $20,000 per Sailor.

Each Sailor's minimum cost package bid would include any NMI for which his value exceeds cost. Thus, given the values shown in Figure 22, Sailor 1's package bid would include incentive 1; Sailor 2's package bid would include incentive 2; and Sailor 3's package bid would include both incentives. The auctioneer then calculates a revised minimum cash bonus to retain. This is the original cash bonus bid minus the sum of the stated values for each NMI included in the package bid. Each Sailor's minimum cost to retain is then this revised minimum cash bonus plus the total cost of any NMIs included in the package bid.

Sailor #	Min. $ to Retain	Incentive 1 Value	Incentive 2 Value	Total Incentive Cost	Total Incentive Value	Revised Min. $ to Retain	Total Cost to Retain	Cash Bonus	Total Value Received
1	$80K	$40K	$10K	$20K	$40K	$40K	$60K	$60K	$100K
2	$90K	$10K	$30K	$20K	$30K	$60K	$80K	-	-
3	$100K	$30K	$40K	$40K	$70K	$30K	$70K	$40K	$110K

Figure 22.   Enlisted Retention Example: CRAM (*After* Coughlan et al., CRAM Presentation)[89]

[89] Coughlan et al., CRAM presentation.

As shown, if the Navy wishes to retain two of these three Sailors, Sailors 1 and 3 would be retained as they have the two lowest total costs to retain. Each of these retained Sailors would receive the NMIs which were included in his package bid. Also each would receive a cash bonus equal to the total cost of the first excluded package bid ($80,000 in the example) minus the total cost of the NMIs included in his package bid.

4.   The Advantage of CRAM

The example in Figure 22 illustrates the money-saving potential of the CRAM Auction. Under a second-price retention auction with monetary incentives alone, Sailors 1 and 2 would be retained for a cash bonus equal to the first excluded cash bonus bid. This is the bid of $100,000 submitted by Sailor 3. Thus, the total cost to retain these two Sailors would be $200,000.

Under the CRAM, however, Sailors 1 and 3 would each be retained at a cost equal to the total cost of the first excluded package bid. This is the cost of $80,000 associated with Sailor 2's minimum cost package bid. Thus, the total cost to retain these two Sailors under CRAM would be $160,000.

Under CRAM, the same number of Sailors was retained at a lower cost to the Navy. This could potentially increase the Sailor surplus. This is possible only because the mechanism substitutes cash SRB payments with NMIs of the same cost to individuals who place different values on them. These values, however, are greater or no less than the Navy's cost. Each Sailor receives at least the same

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surplus he would have received under the monetary auction, but at a lower cost to the Navy: a true win-win situation.

CRAM is able to overcome the weakness of the Universal incentive package by capturing the Navy surplus, represented by the green triangles in Figure 23, and eliminating the waste, depicted by the red triangles. CRAM also captures the surplus from incentives that would not be offered under the UIP. This is represented by the blue triangles in Figure 23.
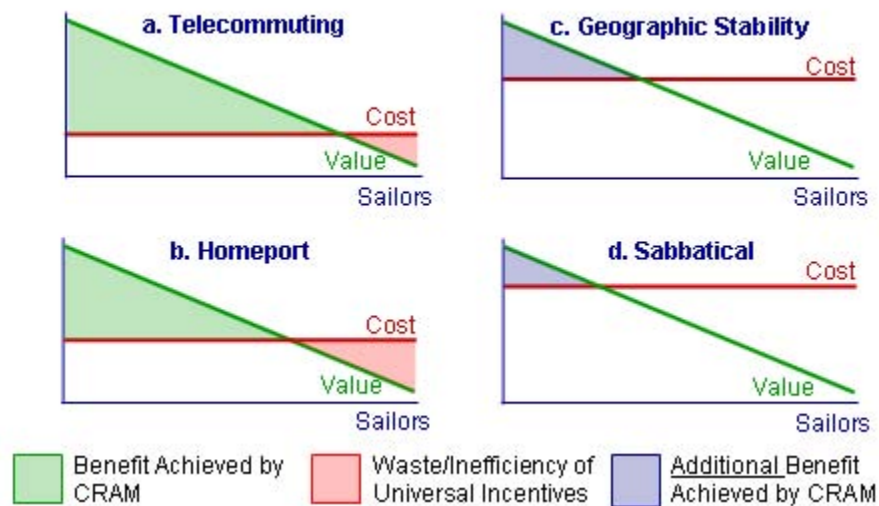
Figure 23. CRAM overcomes the Universal Package Weakness (*After* Coughlan et al., CRAM Presentation)[90]

Further, CRAM eliminates the difficulties involved in identifying the optimal universal incentive package: truthful revelation of the NMI values, identifying the relevant (retained) population of Sailors, and predicting the actual NMI usage rate.

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[90] Coughlan et al., CRAM presentation.

Finally, note that CRAM offers the potential to change the "mix" of Sailors retained. In the example above, Sailors 1 and 2 were retained under a strictly monetary retention auction. Sailors 1 and 3 were retained under CRAM. The potential impact of CRAM on population diversity is discussed further in Chapter VII.

VI. SIMULATION DESIGN AND RESULTS

A. DESIGN

1. General

Using the data from the Enlisted Retention Survey, simulations of the various retention mechanism alternatives were conducted. In particular, three separate reverse second-price auction mechanisms were simulated: Monetary, UIP, and CRAM.

To conduct the UIP and CRAM simulations in particular, some estimate of the marginal (or average) cost of each NMI was necessary. In the absence of specific cost estimates for the various NMIs, costs were based on the value distributions from questions 5-11 in the survey. While the exact cost of each NMI is unknown at this time, it is reasonable (based on the broad range of submitted values) to assume that the cost of each NMI falls somewhere between zero (the minimum and modal value for each NMI) and the maximum submitted valuation (between $25,000 and $90,000, depending on the NMI). Thus, it seemed reasonable to simulate NMI costs as falling within the range (or some sub-range) of the submitted valuations.

To provide the broadest generality of results, two cost assignment methods were used: Varying Percentile Cost (All Positive (VP(AP))) and Varying Percentile Cost (High Positive (VP(HP))). In both approaches, the cost of each NMI was drawn from a subset of the values for that NMI as submitted by Sailors in the Enlisted Retention Survey. In particular, for each simulation trial and for each NMI, a random number was drawn from a uniform distribution between

0% and 100%. Then, for that simulation trial, the cost of the NMI was set equal to the submitted value which corresponded to that randomly drawn percentile.

In the VP(AP) method, the lower bound for the cost of each NMI was based on the percentile that included the first positive value from the respondents' answers. Thus, the cost of each NMI was drawn from the range of positive submitted values for that NMI. To give a more conservative (high) estimate of the costs, the VP(HP) method set the lower bound halfway between the first positive percentile and 100, or the median of the VP(AP) cost possibilities.

Both costing schemes assumed constant marginal costs. Additionally, the NMI values were assumed to be additive for Sailors who received more than one incentive -- unless another value was given by the respondent. Similarly, costs were assumed to be additive for multiple NMIs.

Each Mechanism was simulated at the 25, 50, and 75% retention levels (see Table 4). For perspective, the Navy's current overall Zone A, B, and C reenlistment rate goals are 48, 58, and 82%, respectively.[91]

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[91] Chief of Naval Operations, 2008 Stay Navy Campaign Guidance, DTG 101233Z December 07 (Washington, D.C.: 2007).

Table 4.   Simulation Varieties

Parameter	Val	
Retention Mechanism	1. 2. 3.	
Retention Levels	1. 2. 3.	
Cost Assumptions	1. 2.	

2.   Monetary Only Simulation

To simulate the monetary-only auction, each Sailor's answer from question 4 was used to determine his required SRB. The Sailors were then ranked from most to least expensive. The lowest set of n Sailors was retained and each paid the cash bonus of the first excluded bid (i.e., the $n+1st$ lowest bid). The number of Sailors retained (n) varied according to the retention levels in Table 4.

3.   UIP Simulation

To simulate UIP, it was necessary to determine the appropriate rule for including NMIS in the Universal Package. To be the most "generous" to UIP and, thus, conservative with respect to CRAM's relative performance, the researchers chose a cutoff that was close to optimal for UIP. Although in actual practice, this optimal cutoff would likely be impossible to determine.

The optimal cost cutoff for each NMI was calculated by determining the percentile for which the total Sailor surplus (value minus cost summed over all Sailors with

value greater than cost) equaled the total deficit (cost minus value summed over all Sailors with value less than cost).

Figure 24 illustrates the optimal UIP cutoff percentile for each NMI. This is based on the sample's value distribution. It is important to note that these cutoffs are only truly optimal if the retained Sailor value distribution matches the overall Sailor value distribution. If the retained Sailors actually value the NMIs more than the overall population, the optimal percentile would be higher. Conversely, if the retained Sailors actually value the NMIs less than the overall population, the optimal percentile would be lower.
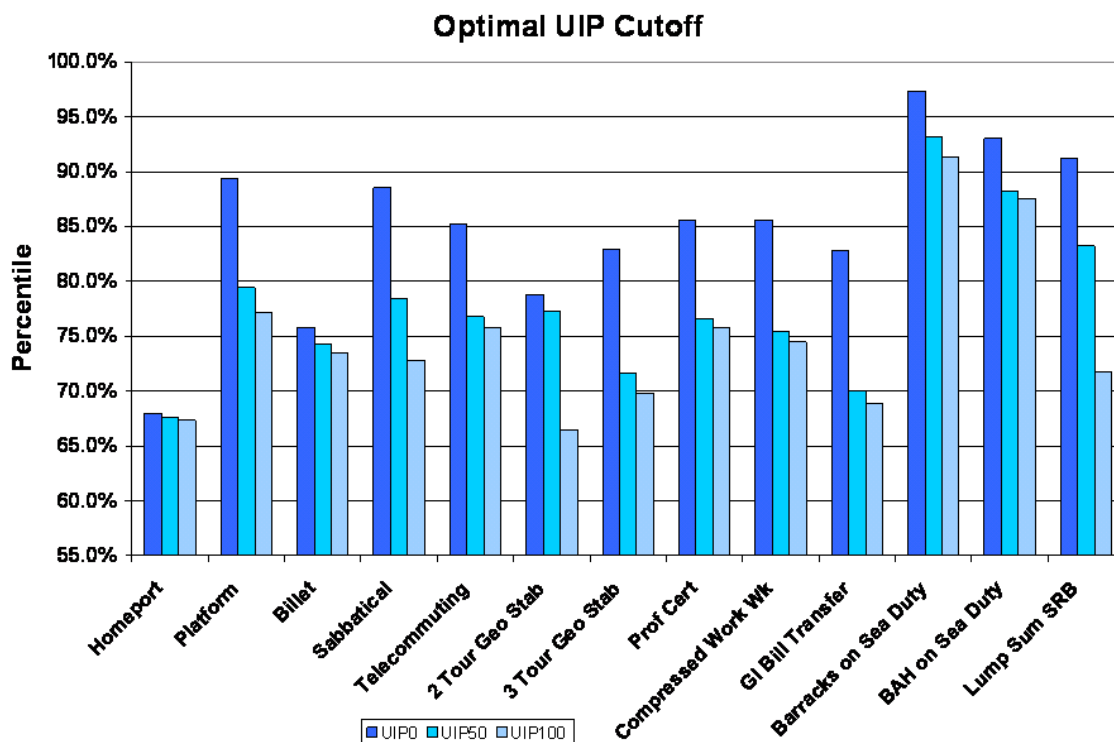
Optimal UIP Cutoff

Figure 24. Optimal UIP Cutoff Percentile

Under the UIP mechanism, any NMI that the Navy offers will be available to all reenlisting Sailors. All Sailors expressing a positive value for this incentive will clearly choose to use the incentive. Some Sailors that do not express a willingness to pay for the NMI may still take advantage of the opportunity given that the incentive is offered at no charge. Thus, a Sailor might have responded in the survey that provision of a particular NMI would not reduce his minimum required SRB at all. The same Sailor might, nonetheless, use that NMI if it were offered to him free of charge.

To determine the total cost of retaining these Sailors, three assumptions about usage of NMIs included in a UIP were compared:

1. UIP(0)- Only those Sailors who placed a positive value on the NMI will actually use it;

2. UIP(50)- 50% of those who place no value on the NMI will also use it;

3. UIP(100) – Everyone retained will use the NMI.

Because the actual usage rate would be somewhere between UIP(0) and UIP(100), the average optimal cutoff would be approximately the 75th percentile, as is shown in Table 5.

Table 5.   Optimal UIP Cutoff Percentiles

	Homeport	Platform	Billet	Sabbatical	Telecomm	2 Tour Geo Stability	3 Tour Geo Stability	Professional Certification	Compressed Work Wek	GI Bill Transfer	Barracks on Sea Duty	BAH on Sea Duty	Lump Sum SRB	Mean	Median
UIP0	68.0%	89.4%	75.8%	88.6%	85.2%	78.8%	82.9%	85.6%	85.6%	82.8%	97.3%	93.0%	91.2%	84.9%	85.6%
UIP50	67.7%	79.4%	74.3%	78.4%	76.8%	77.3%	71.6%	76.6%	75.5%	70.0%	93.2%	88.2%	83.3%	77.9%	76.8%
UIP100	67.3%	77.1%	73.5%	72.8%	75.8%	66.5%	69.8%	75.8%	74.5%	68.8%	91.4%	87.6%	71.8%	74.8%	73.5%

Because it was consistent with the data regarding the optimal cutoff and it was a simple, functional cutoff rule (rather than, for example, using a different cutoff rule for each NMI or using some precise cutoff rule, such as 77.9%), the 75th percentile cost cutoff was used in the simulations. Additionally, by using the 75th percentile cutoff rule, the UIP included only those NMIs where at least 25% of the Sailors valued it more than its cost to provide. This included most of the NMIs, but not those whose costs would exceed more than 75% of the Sailor values.

Note that the simulations using the VP(AP) costing scheme never offered two NMIs in the UIP (barracks room on sea duty and BAH on sea duty) because their first positive values occurred at the 88th and 84th percentiles, respectively. Under the VP(HP) costing scheme, only three NMIs were offered in the UIP. The other 10 NMIs' costs always exceeded the cutoff percentile. This determination worked to the advantage of the UIP by preventing many situations where NMI cost would exceed total Sailor value.

In simulating the Universal Incentive Package, the initial SRB requirement was derived the same way as in the monetary auction: from the values the Sailors provided in the survey. The NMI values from questions 5-11 were then used to determine the value each Sailor placed on each incentive. If an incentive was included in the package, the Sailor's initial SRB was reduced by the stated value placed on that NMI to generate a "provisional" SRB bid for that Sailor. This simulated the process by which a Sailor would bid, given a fixed package of incentives. Note, that

under a UIP retention program, the Navy would not observe the Sailor's willingness to pay (WTP) for the non-monetary incentives. Rather, the Navy would only observe their adjusted SRB bid. The Sailors were then ranked, as before, but based on their new provisional SRB bids. Each retained Sailor received a monetary SRB equal to the first excluded provisional bid.

Retained Sailors were all eligible for the same cash bonus and a standardized NMI package, but each Sailor had a unique "value" for the NMIs offered, depending on his individual preferences.

4.   CRAM Simulation

The CRAM simulations used the same initial SRB (SRB_I), NMI value ($Value_{NMI}$) and NMI cost ($Cost_{NMI}$) determinations as above. Provisional SRB (SRB_P), however, was determined differently than with the universal package. With this mechanism, the Navy would observe both the Sailor's SRB bid and the value he attributes to each NMI. In the simulations, a Sailor was allocated an NMI only if his value exceeded the cost (i.e., Sailor surplus was positive). His provisional SRB (SRB_P) was then set equal to his initial SRB minus his value for each NMI allocated. Sailors were retained, however, based on effective cost ($Cost_E$) to the Navy, using the following formula:

$$Cost_E = SRB_P + \Sigma Cost_{NMI}$$

where the $Cost_{NMI}$ amounts were summed only over those NMIs allocated to that Sailor (i.e., those for which value exceeded cost).

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Sailors were then ranked from highest to lowest effective cost and the least expensive set was retained. The Navy's total cost of each individual retention package was equal to the $Cost_E$ of the first excluded bidder:

SRB_I – $\Sigma Value_{NMI}$ + $\Sigma Cost_{NMI}$.

The cash award for each individual Sailor was determined by subtracting the cost of each allocated NMI from the Navy's total cost of the retention package. Thus, each retained Sailor had the same cost to the Navy (equal to the $Cost_E$ of the first excluded bidder). The cash award, however, depended on how many incentives he received and their individual costs.

The value each Sailor received equaled his cash SRB plus his value for any allocated NMIs. Values varied across Sailors depending on the number of NMIs allocated and the stated value to each Sailor. Nonetheless, in all cases the value each retained Sailor received equaled or exceeded the cost to the Navy of providing the retention incentive package.

5. Simulation Runs

For each retention level described in Table 4, 1,000 trials were simulated to obtain an adequate range of outcomes. Both UIP and CRAM results were compared to the monetary auction. It is important to note that these comparisons assume costs that were allowed to range over the positive portion of value distributions with upper bounds commonly as large as $50,000 or more. If true NMI costs are, in fact, in the lower range of the value distribution, the savings over monetary incentives may be

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significantly understated while, if true costs are in the
upper range of the value distribution, the savings over
monetary incentives may be significantly overstated.

B.   RESULTS

Recall the two cost assignment methods used: Varying
Percentile Cost, All Positive (VP(AP)), and Varying
Percentile Cost, (High Positive (VP(HP)). In the VP(AP)
method, the lower bound for each NMI was based on the
percentile that included the first positive value from the
respondents' answers. The VP(HP) method set the lower
bound halfway between the first positive percentile and
100, or the median of the VP(AP). Table 6 details the
lower bound, mean, median, and maximum dollar amount for
the entire VP(AP). It also details the lower bound and
median for the VP(HP). The VP(AP) mean costs in column 4
provide plausible cost estimates; however, to be
conservative, the upper half of the VP(AP) range was also
sampled to simulate the possibility of higher actual costs.

It is clear from the figure that the VP(AP) lower
bound cost estimates are probably too low as they range
from $1 to $13. What is not clear is where the estimated
costs become reasonable. For example, to provide the
Second Class Petty Officer (with two dependents) from
Chapter II with a one year Sabbatical would cost at least
$6,785 (within the VP(AP) lower half). The example quotes
that amount to provide medical, dental, vision, and
commissary benefits to that Sailor. Additional costs of
administering the program, retraining the individual, and
potential lost productivity would add to that cost
(possibly above the VP(HP) lower bound).

Appendix C contains the detailed results from the VP(AP) method and Appendix D contains the detailed results from the VP(HP) method.

Table 6.   Varying Cost Percentiles for NMI Cost Estimates

	VP(AP) Lower bound		VP(HP) Lower Bound VP(AP) Median		VP(AP) Mean	VP(HP) Median		Maximum
	Percentile	Cost	Percentile	Cost	Cost	Percentile	Cost	Cost*
Homeport	35	$1	67.5	$10,000	$9,749	83.75	$10,000	$50,000
Platform	64	$1	82	$5,000	$7,066	91	$10,000	$50,000
Billet	40	$1	70	$5,000	$8,917	85	$10,000	$51,502
One Year Sabbatical	63.5	$1	81.75	$10,000	$12,917	90.875	$20,000	$65,000
Telecommuting	50	$13	75	$7,750	$11,661	87.5	$15,000	$70,000
Geographic Stability (2 tours)	51	$7	75.5	$5,539	$9,385	87.75	$10,000	$50,000
Geographic Stability (3 tours)	47	$1	73.5	$10,000	$12,460	86.75	$15,000	$80,000
Professional Certification	62	$1	81	$5,000	$9,524	90.5	$10,000	$60,000
Compressed Work Week	60	$1	80	$5,000	$8,157	90	$10,000	$41,026
Transferability of GI Bill	45.5	$1	72.75	$10,000	$12,405	86.375	$20,000	$75,000
Single Barracks Room on sea duty	88.5	$1	94.25	$3,000	$5,446	97.125	$5,650	$25,000
BAH on sea duty	84	$1	92	$5,400	$8,923	96	$10,000	$50,000
Lump Sum SRB	58	$3	79	$5,000	$10,427	89.5	$10,000	$90,000
* excludes outliers								

1.   Varying Percentile (AP) Cost Results

As shown in Figure 25, the largest total dollar savings occurred at the highest retention level. The total CRAM savings increases as the Navy retains more Sailors.
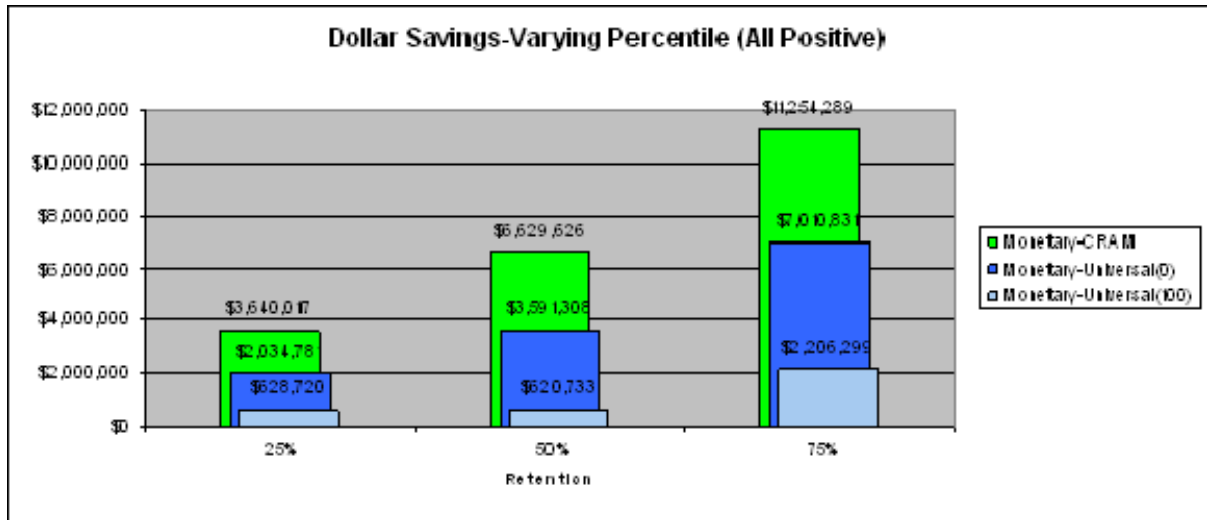
Figure 25.   Average Dollar Savings – VP(AP)

While the total CRAM savings are higher at higher
retention rates, so are total retention costs. At lower
retention rates, the Navy retains Sailors with particularly
high NMI values and low monetary incentive requirements
(high percentage CRAM savings). The Navy is forced to
retain Sailors with lower NMI values and higher monetary
incentive requirements at higher retention rates (lower
percentage CRAM savings). Consequently, the percent
savings gives the opposite results to total savings: there
was a higher percent savings at the lower retention levels.
Figure 26 displays these results. For the VP(AP)
simulations, CRAM produced an average savings over monetary
ranging from 34.3% to 80.4%. UIP's average savings over
monetary was 4.3% (UIP(100)) to 44.9% (UIP(0)).
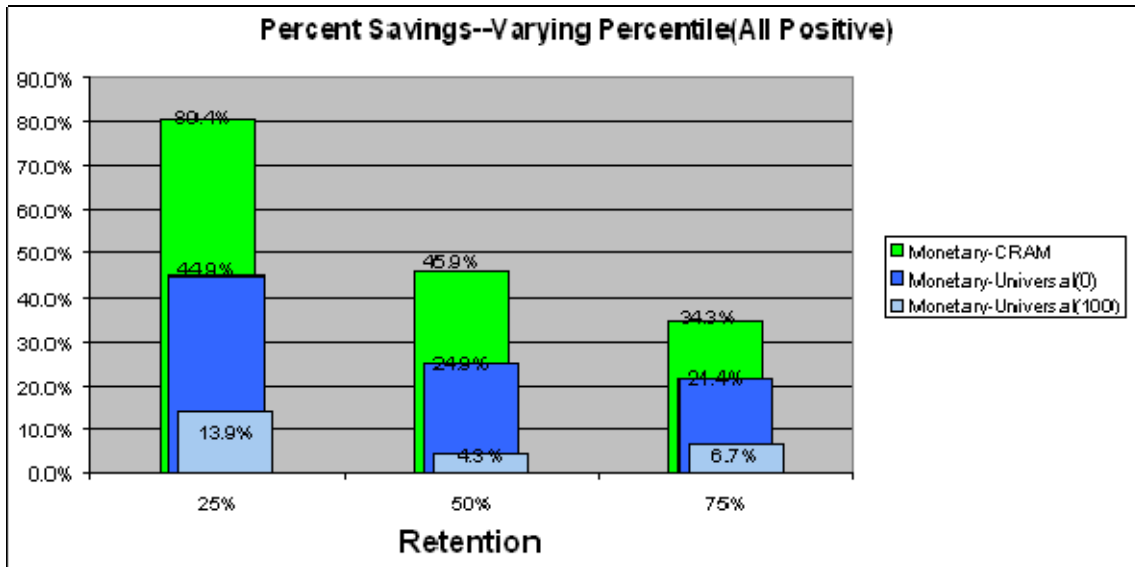
Figure 26.   Average Percent Savings – VP(AP)

2.   Varying Percentile (HP) Cost Results

Recall that when many Sailors value an incentive more than its cost, the Universal Incentive Package can produce large benefits to the Navy. This is shown in the green shaded area in examples a and b in Figure 27. Because all Sailors who place any value on the incentive receive it (even if the Navy's cost exceeds that value), there is also a potential for a significant deficit associated with this incentive. This is shown in the red shaded areas in examples a and b in Figure 27. For NMIs excluded from the universal package, as in examples c and d in Figure 27, potential savings might not be captured at all. In this scenario, the Navy does not provide an incentive that is highly valued by some Sailors.
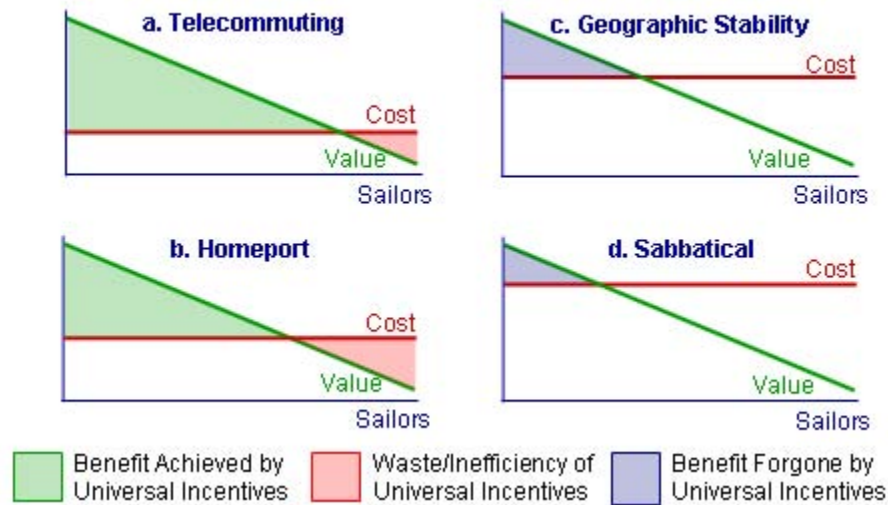
Figure 27.   Limitations of a Universal Incentive Package
(*After* Coughlan et al., CRAM Presentation)[92]

In the simulations, the Universal Incentive Package
generally delivered cost savings compared to the monetary
auction when the assumption UIP(0) was used. In other
words, this occurred when it was assumed that only Sailors
who expressed a positive value for the NMI would actually
use it. Under the UIP(100) assumption (all retained
Sailors use the NMI), however, the average result was a
significant deficit to the Navy as shown in Figure 28.

Because the Navy only included the three NMIs that
were the least likely to have total cost exceed total
Sailor value, the 75th percentile NMI cost cut-off provided
an advantage to UIP. Even with this advantage, the UIP
often performed poorly.

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[92] Coughlan et al., CRAM presentation.
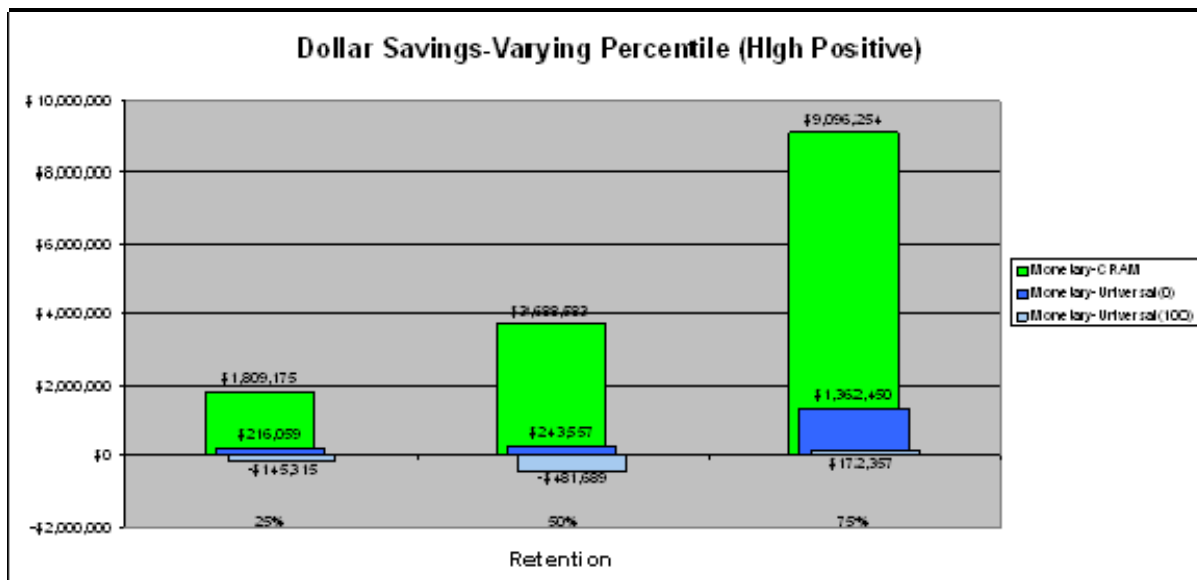
Figure 28. Average Dollar Savings VP(HP)

C.   THE CRAM ADVANTAGE

The CRAM Package only allocates incentives to Sailors who value that incentive more than it costs. This makes it the most efficient method of distributing benefits. In every case, the CRAM Auction out-performed the Monetary Auction in terms of dollars and percent savings (see Appendices C and D). CRAM beat the UIP in all cases as well. Because only three NMIs were offered in the UIP, it is difficult to assess relative performance in terms of dollars saved in the VP(HP) trials. The percentile cutoff worked to the advantage of UIP by not allowing excessively "wasteful" NMIs to be offered. The percent savings shown in Figure 29 is an appropriate approximation.

Percent Savings-Varying Percentile (High Positive)
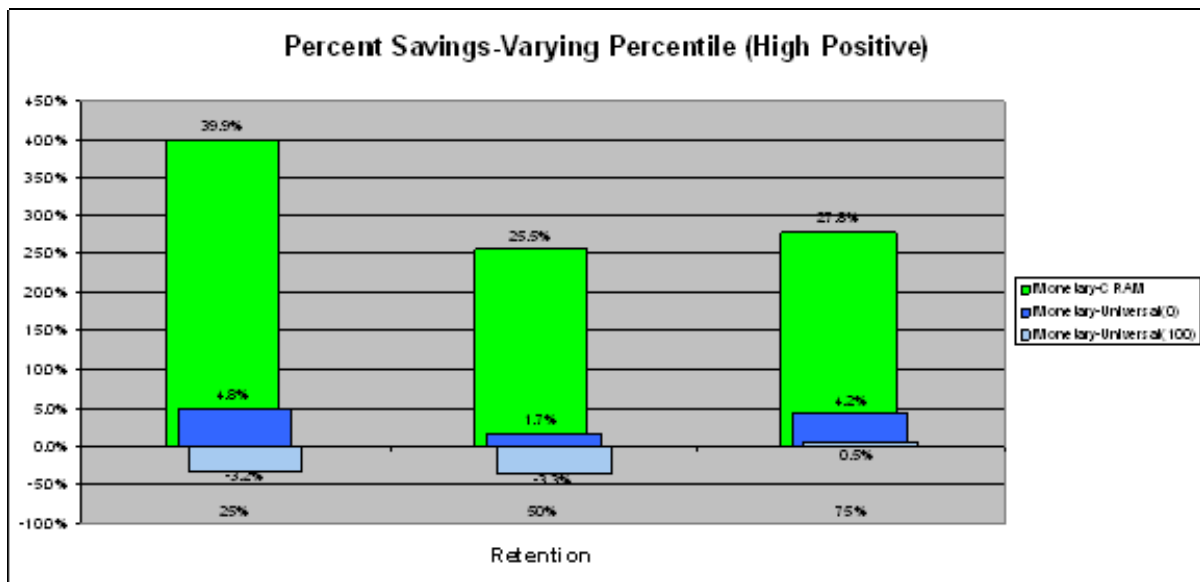
Figure 29. Percent Savings VP(HP)

In the vast majority of cases, CRAM produced savings well above those of the UIP -- especially when 50% or more of the re-enlistees were assumed to use the non-monetary incentives (UIP(50)) and UIP(100)). In the VP(HP) simulations, CRAM savings vs. monetary averaged from 25.5% to 39.9%. UIP vs. monetary ranged from a deficit of 3.3% (UIP(100)) to a savings of only 4.8% (UIP(0)). This was expected, i.e., CRAM only awards a Sailor an incentive if he values it more than it costs the Navy to provide and all incentives are offered -- even if they are only allocated to a few Sailors.

CRAM is able to overcome the weakness of the UIP by capturing the entire potential Navy surplus and eliminating the waste (cases where the Navy's cost exceeds the Sailors' value). CRAM also captures the surplus from incentives that would not be offered under the Universal Incentive Package.

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VII. LINKING PREFERENCES TO DIVERSITY

> As leaders, we must anticipate and embrace the demographic changes of tomorrow, and build a Navy that always reflects our Country's make up. We must lead in ways that will continue to draw men and women to service to our Country and to our Navy. Diversity of thoughts, ideas, and competencies of our people, keeps our Navy strong, and empowers the protection of the very freedoms and opportunities we enjoy each and every day.[93]

A. MOTIVATION

Why is diversity important to the military? If achieved prudently and purposefully, it can enhance the political legitimacy, social equity, and the effectiveness of our military institutions. If applied arbitrarily, capriciously, or to achieve some notion of perfect representation, the resulting force will suffer on all three accounts.

This section will address each of the three core areas of concern: political legitimacy, social equity, and the effectiveness of the military, with respect to population representation, to bear out each one's respective significance. It will then address representation in terms of new hires, known as "accessions" in the military, versus career force structure. Finally, it will discuss how, through reenlistment incentives, the military can achieve the optimal approximate representation desired/required by the society it is sworn to protect.

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[93] Gary Roughead, ADM, USN, "Diversity Policy, 28 Feb 2008." Chief of Naval Operations, http://www.navy.mil/navydata/leadership/ldrDisplay.asp?m=253 (accessed April, 14, 2008).

B. STATISTICAL REPRESENTATION DEFINED

Before discussing the three core areas of concern and how to address them, a brief discussion of statistical representation is necessary.

It is important for the Nation's population to be statistically represented in the military. This does not mean "perfect representation." Rather, it means representation within the acceptable range determined by society: acceptable approximate representation.[94] But what defines the range of acceptable deviations from perfect representation is highly dependent on the current attitudes and priorities of the country as well as the current statutes in effect. For example, prior to 1972 there was a statutory ceiling on the percentage of women allowed in the military. It is no accident that the height of the women's rights movement coincided with the lift on that restriction.

The arguments that are made for moving toward or away from perfect statistical representation center around three areas:

> Military effectiveness -- meeting the need for personnel who are capable of performing military jobs; social equity -- spreading the burden of national defense across all segments of the population; and political legitimacy -- involving

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[94] Mark Eitelberg, "Military Representation Model," https://nps.blackboard.com/webapps/portal/frameset.jsp?tab_id=_2_1&url=%2Fwebapps%2Fblackboard%2Fexecute%2Flauncher%3Ftype%3DCourse%26id%3D_3355_1%26url%3D (accessed February 12, 2008).

the belief that the military ought to be part of society rather separate from it (Eitelberg, 1977).[95]

Dr. Eitelberg discusses these three issues as "a core of concern around an age old question: Who shall serve when not all serve?"[96]

Additionally, most often the military focuses on accessions and shifts policies to affect enlistment proportions while ignoring the reality that many of the "undesirable" representation issues are a function of who chooses to stay versus who chooses to join.[97] Perfect representation is not possible because, by its nature, the military is exclusionary: there are age limits, physical ability minimums, and fitness standards that are necessary to ensure minimum requirements for service.[98] Even if the United States reinstated a random draft, it could not achieve perfect representation due to these limitations. What is more interesting is trying to determine where the right level of representation lies and how to achieve it.

C.   POLITICAL LEGITIMACY

Throughout its history, the United States has had a significant distrust of a standing Army. This pattern can be traced back to the Revolutionary War when the Continental Army was disbanded after the colonies gained

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[95] U.S. Congressional Budget Office (CBO), *Social Representation in the U.S. Military*, The Congress of the U.S. Congressional Budget Office, (Washington, D.C.: Government Printing Office, 1989), 5. http://www.cbo.gov/ftpdocs/67xx/doc6746/89-CBO-044.pdf (accessed February, 26 2008).

[96] Eitelberg, *Military Representation Model.*

[97] CBO, *Social Representation in the Military*, 15.

[98] CBO, *Social Representation in the Military*, 14.

independence. It has been borne out, time and again, following significant military campaigns. The framers of the Constitution were influenced by their experiences with the ubiquitous armies of Europe and their oppression of the people they were bound to protect. They recognized a need for a "common defense" but were leery of giving too much power or substance to that same body.[99] Another common theme in the Nation's history has been the quest to create a military that "looks like" American society. This is presumably to quell the fear of a standing army. If society shares a common ground with the military, it will either avoid conflicts of interest or a military subculture of "violent minded" individuals that would rise up against the people.[100] "Political legitimacy is most commonly associated with geographic representation because of presumed regional differences in attitudes toward the military (Eitelberg, 1979)."[101]

From a civilian point-of-view, those needs have formed the genesis for the quest for political legitimacy. For the military, political legitimacy is crucial to obtain funding, aid, and comfort from the Nation's citizens. Additionally, ensuring more geographical representation would be more likely to produce political leaders with military backgrounds and experience who would "grasp the complexities of defense policy [through their] first-hand

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[99] David R. Segal and Mady Wechsler Segal, "America's Military Population," *Population Bulletin, 59* (4), 3-40 (December, 2004): 1-2.

[100] U.S. Congressional Budget Office, *The All-Volunteer Military: Issues and Performance,* The Congress of the U.S. Congressional Budget Office, (Washington, D.C.: Government Printing Office, 2007), 11. http://www.cbo.gov/ftpdocs/83xx/doc8313/07-19-MilitaryVol.pdf (accessed February 26, 2008).

[101] CBO, *Social Representation in the Military*, 15.

experience with the military."[102] Yet, in terms of enlisted accessions, the southern United States continues to be overrepresented and the northeast continues to be underrepresented. "The representation ratio (percentage of accessions divided by percentage of 18-24 year-olds from the region) for active accessions from the South was 1.2, compared to 0.7 for the Northeast, 0.9 for the North Central, and 1.0 for the West."[103] This unbalanced distribution may have a negative impact on both the civilian and military needs for political legitimacy.

D. SOCIAL EQUITY

In contrast, social equity has been a relatively recent concern with respect to military service. There are countless examples of inequality and discrimination in the Nation's history. Consequently, these inequities have characterized its military institutions. But the United States has evolved into a socially conscious society well on its way to achieving equal opportunity and social equity. Understandably, the military has paralleled, and often outpaced, the society of which it is a small but vital component.

The concern of social equity is centered on the issue of the "burden" of service.[104] The element of social equity becomes increasingly important to society in a time of war

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[102] CBO, *Social Representation in the Military*, 2.

[103] Office of the Under Secretary of Defense, Personnel and Readiness (OSD(P&R)), FY 2005, *Population Representation in the Military Services,* DefenseLink.mil, vii. http://www.defenselink.mil/prhome/poprep2004/index.html (accessed: February 2008)

[104] CBO, *Social Representation in the Military*, 8.

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when burdens appear to outweigh benefits. The argument is
that the physical dangers and personal sacrifice of
military service are endured by the poor and minorities in
higher proportion to their representation in society as a
whole. This hypothesis is supported with historical
anecdotes referencing military exemptions that range from
paying a substitute to serve on one's behalf to waivers of
service for college students -- all of which favor the
wealthy and privileged.[105]

On the surface, the unequal burden hypothesis appears
to continue to be true. The 2007 CBO study, however,
showed this situation to be diminishing: African Americans
were still overrepresented in the force, but
underrepresented in new accessions and the "CBO analysis
suggests that youths are represented…at all socioeconomic
levels. However, young people from the lowest income and
highest income families are less likely to be represented
in the enlisted force than their peers."[106] This appears to
refute the claim that the very poor are shouldering the
majority of the burden. Additionally, "black recruits were
more likely to come from the highest black family incomes;
a change from earlier in the decade."[107] This suggests that
the assertion of "economic conscription"[108] of minorities
may be overstated.

Furthermore, representation in the military does not
necessarily equate to "burden" in terms of physical danger

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[105] CBO, *The All-Volunteer Military,* 3-5.

[106] CBO, *The All-Volunteer Military,* 30.

[107] CBO, *The All-Volunteer Military*, 29.

[108] CBO, *Social Representation in the Military*, 9.

and risk of death. In an investigation of the racial and ethnic makeup of the combat operations in Iraq and Afghanistan through December 2006, the 2007 Congressional Budget Office (CBO) study found that while representation in those theaters was an accurate reflection of the racial and ethnic representation in the force, "white service members have a higher representation in combat operations (75[%]) than in the force as a whole (68[%]), whereas black service members have a lower representation in those occupations (13[%]) than in the overall force (19[%]) …. Data on fatalities indicate that minorities are *not* (emphasis added) being killed in those operations at a greater rate than their representation in the force. Rather, fatalities of white service members have been higher than their representation in the force (76[%] of deaths in those two theaters through December 2006)."[109]

But even if the burdens of military service are disproportionately shouldered by certain groups, the individuals in those groups receive benefits that might not be available elsewhere.[110] Even if the claim of economic conscription, where underprivileged youth are forced to choose between enlistment and unemployment is valid, the alternative may be much worse: unemployment is the only answer.[111]

Another benefit to military service is the absence of gender discrimination: "Sixteen percent of female officers and 34 percent of enlisted women are black compared with 9

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[109] CBO, *The All-Volunteer Military*, IX.

[110] CBO, *Social Representation in the Military*, 11.

[111] CBO, *Social Representation in the Military*, 10-11.

percent of male officers and 20 percent of enlisted men…
many black women see the military as providing greater
opportunities and benefits than the civilian labor
market."[112]

The numbers on recruitment do not tell the whole
story. In fact, when the career force is considered, a
different representation tale is told. While African
Americans show an increase in proportions from accessions
to force structure, women and Hispanics show a decrease.
This reflects a disparity in what drives enlistment with
what drives retention. Women show a lower propensity to
reenlist. If the goal is to raise the proportion of women,
or at least maintain the present level, the military has
two options: recruit more women to account for the higher
non-reenlistments (a costly proposition) or institute
policies to retain more women.

There are limits to the degree to which the military
should strive to achieve social equity, however. The
nature of its business rightfully excludes certain members
of society. The aged, infirm, and the young are 3 groups
who are completely unrepresented in the military. This is
because the cost of their presence in terms of lost
military effectiveness would far outweigh the benefits to
social equity.

E.   MILITARY EFFECTIVENESS

Approximate representation in terms of Social Equity
and Political Legitimacy is desirable and necessary, but
only up to the point where it begins to hinder military

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[112] Segal and Segal, "America's Military Population," 19.

effectiveness. Determining where that point lies is beyond the scope of this paper. History, however, has shown that military effectiveness must take precedence over the desire for social equity and political legitimacy when these goals are conflicting.

Examples of this trade-off abound. Women represent almost 50% of the eligible population, yet comprise slightly less than 15% of the active duty force. Since the statutory ceiling on the percentage of women in the force was lifted in 1972, there has been a very slow and calculated increase in the proportion of women who serve. Failure to do so would have produced extreme logistical difficulties and hindered the military's ability to achieve its mission. Women are still forbidden to serve in approximately 20% of all military positions including ground combat units.[113] The failure to require women to register for the draft underscores the negative effect that perfect representation would have on military effectiveness. This illustrates the military's deliberate "correction" of social inequity to reflect current attitudes and priorities while preserving military effectiveness.

Minimum education, physical, and moral standards are required for enlistment. Relaxing these standards would most likely increase the level of representation of certain groups, but at a cost to effectiveness that is unacceptable to decision-makers. The 1989 CBO report shows that more than 90% of total-force recruits were high school graduates compared with the less than 80% graduation rate of their

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[113] Segal and Segal, "America's Military Population," 18.

civilian counterparts. Additionally, a force that
perfectly represented the Nation in terms of aptitude would
include 23% of the Nation's youths who scored between 10
and 30 on the Armed Forces Qualification Test (AFQT).
Currently, the service-wide average is less than 10% of
those individuals. United States law forbids joining by
those that score below 10 on the AFQT. Education and
aptitude are currently the best measures of effectiveness
available. Therefore: "military effectiveness now argues
for maintaining the clearly unrepresentative nature, in
terms of education and test scores, of the recruits being
brought in under the All Volunteer Force [which is
unrepresentative in those terms]."[114] "In 2006, 69[%] of
recruits scored at or above the [50th] percentile [category
IIIA and above], relative to the overall United States
youth population."[115] This assertion is supported by the
CBO's 2007 report that states that the percentage of
enlistees with High School Diplomas continues to outpace
the civilian population by the same degree.

F.   ACCESSION REPRESENTATION VERSUS FORCE REPRESENTATION

Certainly, recruitment representation is important
when analyzing the demographic shape of today's military.
It, however, only tells part of the story. The make-up of
the career force is equally, if not more, important and is
a related consequence of the composition of accessions.
Today's career force does not look the same as the
accessions that feed it, however. There is a disconnect
between incentives to join the military and decisions to

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[114] CBO, *Social Representation in the Military*, 8.

[115] CBO, *The All-Volunteer Military*, 15-16.

stay in the military. African Americans are under-
represented in terms of accessions -- 13% in 2005 --, but
overrepresented in terms of career force -- 19% in 2006 --
compared to 14% of the overall population. Women joined at
a rate of 16.5%, yet, in 2004, the total force percentage
was only 14.8%. In 2004, 12.9% of accessions were
Hispanic, yet only 9.8% of the total force was represented,
compared to that ethnicity contributing to 16.4% of the
eligible population.[116] In force shaping endeavors, the
Navy must determine why this disparity occurs and strive to
provide reenlistment incentives to achieve the optimal mix.

G.   CRAM'S FORCE-DIVERSIFICATION POTENTIAL

For a 25% retention rate, 151 of 604 Sailors were
retained under all retention mechanisms simulated. Under
the CRAM auction, depending on the NMIs offered, a
different set of Sailors was retained. This contrasts with
those retained under the strictly monetary retention
auction. Some Sailors were present in both groups
(overlap). For example, when all 13 NMIs were offered, the
overlap was 45 Sailors. This means 106 different Sailors
were retained by offering NMIs. But, who are these Sailors
and how does their retention affect the demographic
composition of the fleet?

To test the effects of offering different combinations
of NMIs, five CRAM auctions were simulated. The
researchers adjusted the offerings to produce the largest
positive increase in the following groups: females,
African Americans (black), Hispanics, Sailors with an

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[116] OSD(P&R), *Population Representation in the Military*.

Associate's Degree or higher, and Sailors age 27 and under. As costing data was unknown, the cost of incentives was assumed to be zero to fully compare relative values. The 25% retention rate was used to capture the individuals with the highest values for the individual NMIs.

The sample was too small and narrow to prove any differences statistically significant or applicable to the entire enlisted force, but the findings deserve mention and further study. Appendix E contains results of selected NMI combinations and their impacts on representation by gender, race/ethnicity, education level, and age. Note: there are cases when the results from this sample show a decrease in retention of certain protected groups. Policy makers must be careful to ensure that offering NMIs does not have an adverse impact.

1. Gender

By offering choice of homeport and billet only, CRAM produced the largest positive change in female representation. This group increased five percentage points from 16% of those retained to 21%. This resulted in just over a 30% increase in retention. This implies, for this sample, homeport and billet choices are the most valuable non-monetary incentives to these women. While sabbatical, telecommuting, and compressed workweek did not produce the largest increase, the inclusion of these benefits also increased female retention as shown in Table 7.

Table 7.   Gender Representation with CRAM

Gender	SRB Only	HP, Billet	HP, Billet, Sabbatical	HP, Billet, Telecomm	HP,Billet, Compressed Week	All 5
Female	16%	21%	19%	18%	19%	17%
Male	81%	77%	79%	81%	79%	82%
No Answer	3%	2%	2%	1%	2%	1%

In this sample, almost 53% of the females were ACs. Under the monetary auction, the retained female ACs represented just over 20% of the females in the sample. When the five NMIs listed in Table 5 were offered, the female ACs retained represented only 16% of the females in the sample. Put another way, representation of retained female FCs increased from just over 5% of the females in the sample to almost 11%. With only choice of homeport and billet offered, ACs represented 24% of the females and FCs just fewer than 10%. This may be because the benefits offered under sabbatical, telecommuting, and compressed workweek are more appealing to FC women as their rate spends 70% of its time at sea. Or it could be that female ACs do not find these options necessary or feasible as they are in a shore-intensive, fixed-schedule job. In any case, the results may not be applicable to the entire enlisted population. This underscores the necessity of a more rigorous analysis involving a larger and more diverse sample.

2.   Race/Ethnicity

Two demographic groups were identified for these simulations: African American (black) and Hispanic.

a.   African American

Figure 28 compares the results of a monetary only auction and a CRAM auction offering choice of homeport, compressed workweek and lump sum SRB. Again, the results show an increase in the percentage of blacks retained implying, for this sample, that these NMIs are the most valuable to this demographic group.
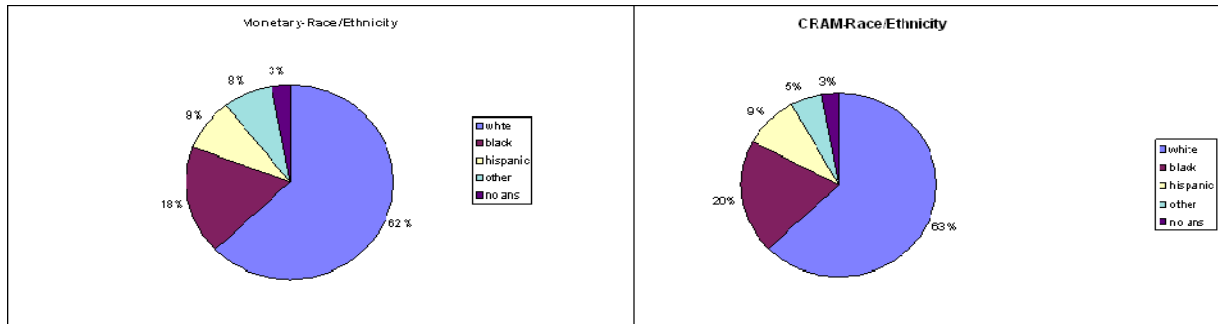
Figure 30.   Black Representation with CRAM

b.   Hispanic

For Hispanics in this sample, the most valuable NMIs appeared to be choice of platform, two-tour geographic stability, professional certification and lump sum SRB. Figure 31 displays the contrast in representation between the monetary only auction simulation and the CRAM auction with the above offerings. The increase in Hispanic representation is just over 44%.
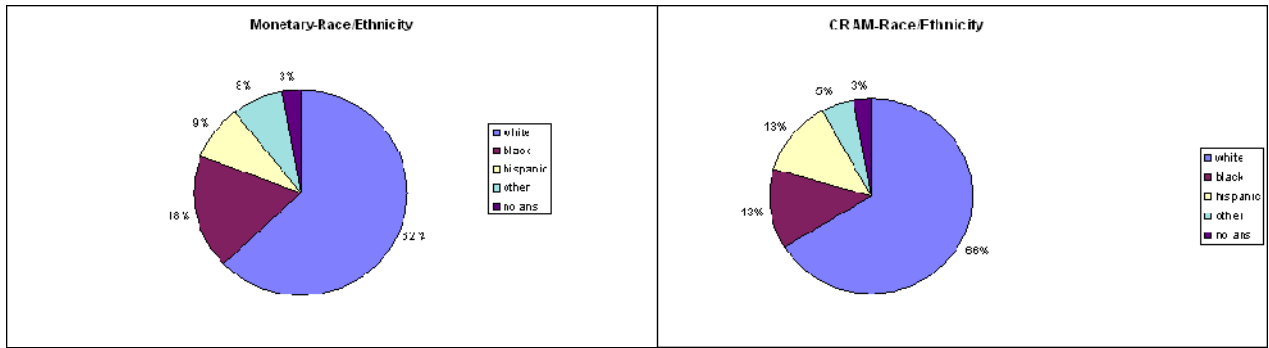
Figure 31.   Hispanic Representation with CRAM

3.   Education

If the Navy is to attract personnel with higher levels
of education, the results of this sample's CRAM auction
suggest that offering a choice of homeport, choice of
platform, sabbatical, telecommuting, compressed work week,
a barracks room while on sea duty, and a lump-sum SRB could
increase the representation of this group. In this sample,
the percent of retained Sailors with an Associate's Degree
or higher increased from 23% to 36% -- an increase of 52%.
Figure 32 shows these results.
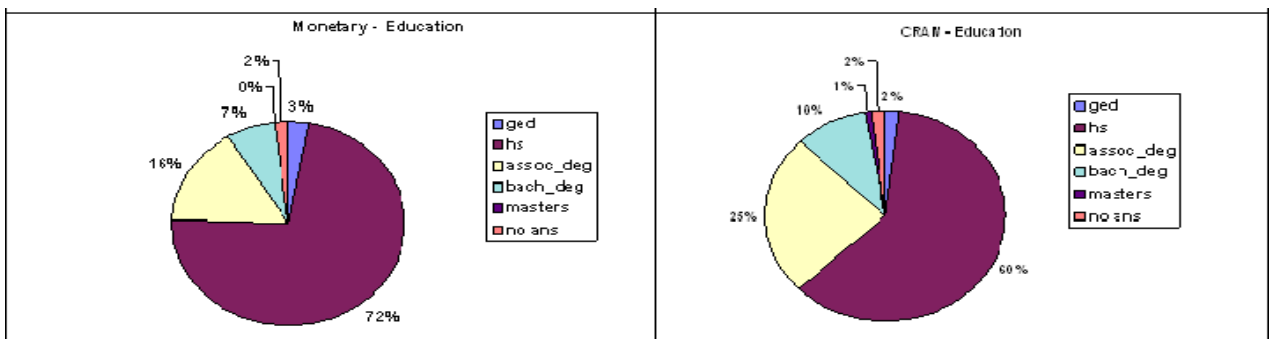
Figure 32.   Education Level Representation with CRAM

4.   Age

The respondents were grouped into four different age groups representing three "generations:" Baby Boomers (those over 42), Generation X (age 28-42), and Generation Y (age 21-27 and those under 21). According to the 2005 *Population Representation in the Military Services*,[117] Generation Y Sailors comprise 62% of the force; Generation X accounts for almost 35%; and the remaining 3% consist of Baby Boomers. The representation of Generation Y Sailors will only increase as the Baby Boomers and older Generation X Sailors retire. The sample from the Enlisted Retention Survey was almost 57% Generation Y, 40% Generation X, and just over 2% Baby Boomers.

As Figure 33 illustrates, 45% of retained Sailors were from Generation Y using a monetary-only approach. With a CRAM auction, offering choice of platform, choice of billet, sabbatical, telecommuting, three-tour geographic stability, professional certification, compressed work week, a barracks room while on sea duty, and lump sum SRB, 50% of those retained were from this generation.
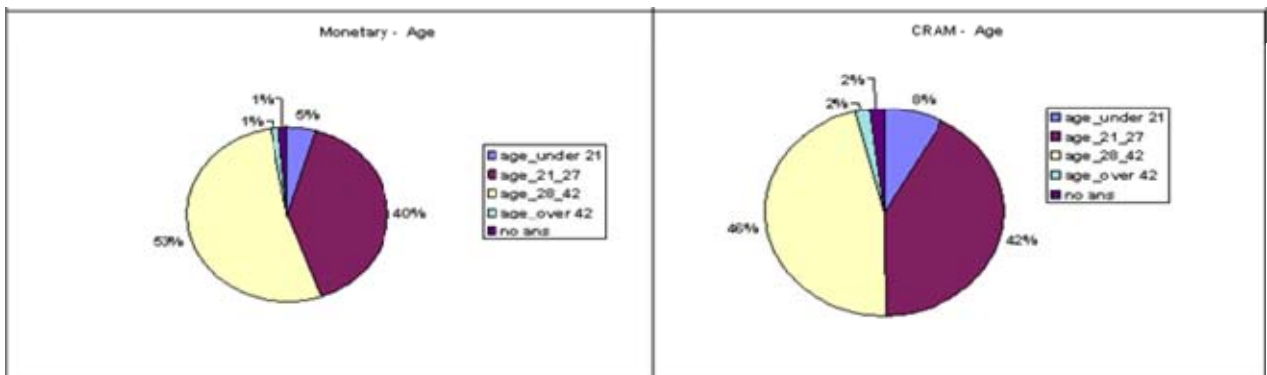
Figure 33.   Age Representation with CRAM

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[117] OSD(P&R), *Population Representation in the Military*.

H.   SUMMARY

This chapter demonstrates CRAM's potential as a force-diversification tool, although it only addresses diversity in terms of retention -- not accessions, attrition, or promotion. It is important to note that CRAM achieves enhanced diversity without giving particular retention preference to any group. It simply offers what is most important to its members in the hopes of increasing their retention.

The reader should nonetheless be cautioned: these results are not conclusive. The sample is too small and narrow in scope for statistical inference. The results do, however, show CRAM's potential effect on population representation.

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VIII. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

A. SUMMARY

This research addressed the potential retention and cost impacts of providing an optimal individualized portfolio of non-monetary and monetary incentives to influence reenlistment and retention behavior in enlisted Sailors.

The Enlisted Retention Survey and subsequent auction simulations showed:

1. A combinatorial auction mechanism providing individualized portfolios of non-monetary and monetary incentives, promising a more cost-effective means to influence reenlistment/retention behavior over monetary incentives alone.

2. A way to determine the optimal mix of monetary/non-monetary incentives that would be both valued by Sailors and cost-effective for the Navy.

3. The auction design that would allow the Navy to tailor monetary/non-monetary reenlistment incentive packages to individual Sailors while simultaneously economizing Navy resources.

4. The potential cost savings the Navy might expect by moving from purely monetary reenlistment incentives to a portfolio of monetary/non-monetary incentives -- if both reenlistment incentive programs are optimally designed.

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5. How population representation might be affected
by offering these reenlistment incentives.

This thesis focused on exploring three mechanisms for administrating enlisted retention: a purely monetary auction, a Universal Incentive Package (UIP) auction, and the Combinatorial Retention Auction Mechanism (CRAM).

The mechanisms were simulated, their outcomes compared, and their respective strengths and weaknesses explored. CRAM clearly outperformed the monetary and UIP auctions. Cost savings to the Navy ranged from 25-80% over monetary incentives alone. While the UIP was shown to be simpler in implementation than the version of CRAM simulated here, the potential for significant deficit (with UIP) was illustrated both conceptually and in the simulations. While not the focus of this thesis, CRAM auction variants can be designed to simplify implementation while retaining the essential CRAM performance characteristics as discussed below in the implementation section.

The final product is a retention approach that is applicable to any community (enlisted or officer, surface or aviation) by simply changing the offerings and associated reservation values.

Additionally, this research addressed the force-diversifying potential of CRAM. For the sample used, it was shown, that offering certain non-monetary incentives changed the demographic mix of Sailors retained. Due to the small sample size, these results are not conclusive, but do provide support for further research.

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Another benefit of CRAM that can perhaps not be quantified is the psychological benefits of choice. By creating an environment where Sailors choose the benefits that best suit them, they will be encouraged to recognize the true composition of their total rewards package and may also realize an increase in value by having a voice in their compensation. By allowing Sailors to choose only those benefits which suit them, the Navy can eliminate the waste associated with unwanted benefits while at the same time empowering its members.

B.   CONCLUSIONS

There already exists substantial research that supports the effectiveness of a Total Rewards approach to compensation. There is also evidence that an auction mechanism to determine proper bonus levels would be beneficial to manpower analysts. This thesis combines these two notions into a tool for planners to effectively and efficiently manage retention and reenlistment behavior.

Results from the Enlisted Retention Survey and subsequent auction simulations estimate a savings of between $7,000-10,000 per Sailor for the population sampled.

C.   RECOMMENDATIONS

1.   Implementation

The authors suggest first implementing these auctions on a small scale, with one or two ratings, in a pilot program. This approach will allow planners and participants to become comfortable with the new system and to work out any issues that may arise.

The implementation of Navy-wide retention auctions
would require substantial reworking of the current
reenlistment system. To obtain sufficient numbers for each
auction, mass reenlistment "seasons" would have to be
established. A Sailor could still maintain his current end
of obligated service (EAOS), but he would be required to
commit to an additional obligated service during the
reenlistment season prior to his EAOS. An example of this
would be to have quarterly reenlistment seasons: one each
in January, April, July, and September. If a Sailor's EAOS
was May 8, he would be required to participate in the
January reenlistment season auction and commit, at that
time, to reenlisting on or before May 8. This system would
have an additional benefit of preventing billet gaps that
ensue from unplanned EAOS losses.

The simplest way to implement CRAM would be a
"cafeteria-style" plan where Sailors are given a menu of
NMIs along with their associated costs. Each Sailor would
be able to select which NMIs he would like included in his
retention package. The Sailor would understand that the
listed cost of any NMI selected would be added to his
requested SRB amount to determine his total retention cost
(and, thus, his likelihood of being retained). Each Sailor
would be best served only to select the NMIs he believes he
values as much or more than its cost. After choosing from
the available NMIs, each Sailor would then submit a cash
bid indicating the minimum amount he would require for
reenlistment given that he would also receive his selected
NMIs.

A further extension of this system is a two-phase reenlistment process. Sailors would bid on the NMIs in an open auction for the six months prior to their retention season. After "winning" his provisional NMIs, a Sailor would participate in the next season's retention auction, bidding for retention with his individualized package of incentives.

2. Further Research

Further research is definitely warranted. The data used in the simulations was relatively small (604 observations) and the scope was relatively narrow (E-6 and below Navy ACS and FCs). The model itself, however, can easily be adapted to accommodate a larger sample and more diverse group.

The authors suggest administering a Navy-wide Enlisted Retention Survey similar to the one in Appendix A to obtain value distributions that can be used for statistical inference.

Accurate cost data is also essential to fully determine the cost saving scope of this mechanism. Research is presently ongoing to discover theses costs. Pilot programs, as suggested in the implementation section, would also provide more accurate cost data.

D. A FINAL WORD

Providing a Total Rewards package consisting of monetary and non-monetary benefits individually tailored to meet the needs of each individual Sailor is a lofty goal. It, however, is one that is certainly attainable and well worth the effort. Through the use of CRAM, the Navy can

empower its members by giving them a voice in their
compensation and save itself potentially hundreds of
thousands of dollars in wasted benefits: truly a "win-win"
situation.

APPENDIX A. ENLISTED RETENTION SURVEY

Naval Postgraduate School Participant Consent and Risk Management Statement

Introduction:
We invite you to participate in our survey entitled "Non-Monetary Retention Incentives Survey" being conducted by the Naval Postgraduate School of Business and Public Policy.

We appreciate your participation in assessing the current and future state of Naval Enlisted Personnel Reenlistment Incentives.

The purpose of this survey is to assess how much you would value the included non-monetary benefits if they were offered as a part of your reenlistment package. Their inclusion in this survey does not imply that they will be offered in the future.

Compensation:
No tangible rewards will be given for completion of this survey. Results of the survey will be available for review upon research completion.

Procedures:
If you agree to participate in the survey, please complete the survey. The survey will take approximately 10 minutes to complete. Please read each question carefully prior to answering. Questions 4-12 require actual dollar amounts as answers.

Confidentiality and Privacy Act:
Results of this survey will be kept confidential and all privacy will be safeguarded. Personal identity will not be compromised as a result of participating in this survey.

Points of Contact:
Should you have any questions or comments regarding this survey, please contact the Principal Investigator Bill Gates, (831) 656-2754, bgates@nps.edu. Any other questions or concerns may be addressed to the Institutional Review Board Chair, LT Brent Olde, (831) 656-3807, baolde@nps.edu.

Consent:
I have read and understand the above information. My participation is completely voluntary, and I have the right to withdraw at any time without penalty or obligation. I have asked all questions and have had my questions answered. I agree to participate in this study. I will be provided a copy of this form for my records.

Survey Questions

1. I agree to participate in this survey?

◯ A. Yes

◯ B. No

2. How would you describe your current level of job satisfaction?

◯ A. Very Satisfied

◯ B. Satisfied

◯ C. Somewhat Satisfied

◯ D. Somewhat Dissatisfied

◯ E. Dissatisfied

◯ F. Very Dissatisfied

3. What was/will be your primary reason for accepting/declining the Selective Reenlistment Bonus (SRB), if offered?

A. Reason for Accepting	
B. Reason for Declining	

The following questions allow you to place a dollar value on the included non-monetary benefits by establishing a baseline dollar amount (SRB) you would require for reenlistment (question 4) and then asking how much in dollars of that bonus you would be willing to give up to receive the indicated non-monetary benefit.

These values are critical to establishing the cost-effectiveness of offering each benefit.

4. What is the minimum amount of money (in dollars) you would require as a total Selective Reenlistment Bonus (SRB) payment (above and beyond your salary and other pays) to commit to 4 more years of active duty?

○ A. I would reenlist even if no SRB were offered.

○ B. No amount of money would entice me to reenlist.

○ C. I would require a minimum of $_____ to reenlist for 4 years.

_____

Each letter option in each question (5-11) should be considered separately.

5. Assuming the SRB amount you specified is available to you, how much of this bonus (in dollars) would you be willing to give up if you were guaranteed the following:

A. Homeport of Your Choice _____

B. Platform Type of Your Choice _____

C. Billet Type of Your Choice _____

6. Assuming the SRB amount you specified is available to you, how much of this bonus (in dollars) would you be willing to give up if you were guaranteed the following:

A. One Year Sabbatical (sabbatical is defined as an unpaid year to spend as you wish, while retaining benefits, but not accruing retirement time) _____

B. Telecommuting (telecommuting would allow you to work from home on scheduled days) _____

C. Geographic Stability – 2 tours (average 6 years) (geographic stability allows personnel to serve two consecutive tours in the same geographic area) _____

D. Geographic Stability – 3 tours (average 9 years) (geographic stability allows personnel to serve three consecutive tours in the same geographic area) _____

7. Assuming the SRB amount you specified is available to you, how much of this bonus (in dollars) would you be willing to give up if you were guaranteed the following:

A. Professional Certification Program in your rating _____

B. Compressed work schedule (a compressed work schedule allows personnel to fulfill their work-hours obligation by working longer hours in fewer days; for example five 8-hour days could be compressed into four 10-hour days)

C. Transferability of GI Bill benefits (to spouse or child) _____

8. Assuming the SRB amount you specified is available to you, how much of this bonus (in dollars) would you be willing to give up, if you were guaranteed the following while assigned to a ship (please indicate if Not Applicable to you (for example, you already receive BAH while assigned to a ship)):

A. Single Barracks Room while in port _____

B. Basic Allowance for Housing (BAH) _____

9. Assuming the SRB amount you specified is available to you, how much of this bonus (in dollars) would you be willing to give up, if you were offered a single, lump sum payment of your SRB instead of the existing policy? The existing policy calls for fifty percent of the SRB to be paid at the time of reenlistment with the remaining fifty percent paid in equal annual installments each October over the contract period. For example, a four year reenlistment contract would have one lump sum payment of fifty percent and three annual installments (OPNAVINST 1160.8A).

10. Assuming the SRB amount you specified is available to you, how much of this bonus (in dollars) would you be willing to give up if you were guaranteed the following:

A. Homeport of Your Choice and Geographic Stability (2 tours) _____

B. Homeport of Your Choice and Compressed Work Week _____

C. Geographic Stability (2 tours) and Compressed Work Week _____

D. Homeport of Your Choice, Geographic Stability (2 tours) and Compressed Work Week _____

11. Assuming the SRB amount you specified is available to you, how much of this bonus (in dollars) would you be willing to give up if you were guaranteed the following:

A. Lump Sum SRB and Telecommuting _____

B. Lump Sum SRB and Homeport of Your Choice _____

C. Telecommuting and Homeport of Your Choice _____

D. Lump Sum SRB, Telecommuting and Homeport of Your Choice _____

12. Assuming the SRB amount you specified is available to you, how much of this bonus (in dollars) would you be willing to give up if you were guaranteed your choice of two of the following, please indicate which two you would choose.

Please Check Two Options:

☐ A. Homeport of Your Choice

☐ B. Platform Type of Your Choice

☐ C. Billet Type of Your Choice

☐ D. One Year Sabbatical

☐ E. Telecommuting

☐ F. Geographic Stability (2 tours)

☐ G. Geographic Stability (3 tours)

☐ H. Professional Certification Program

☐ I. Compressed Work Schedule

☐ J. Guaranteed Barracks Room while In-Port

☐ K. BAH while on sea duty

☐ L. Lump sum SRB

☐ M. Transferability of GI Bill benefits (to spouse or child)

***Dollar Value (of SRB) you would be willing to give up for the checked options:

☐

13. Assuming the SRB amount you specified is available to you, how much of this bonus (in dollars) would you be willing to give up if you were guaranteed your choice of three of the following, please indicate which three you would choose.

Please Check Three Options:

☐ A. Homeport of Your Choice

☐ B. Platform Type of Your Choice

☐ C. Billet Type of Your Choice

☐ D. One Year Sabbatical

☐ E. Telecommuting

☐ F. Geographic Stability (2 tours)

☐ G. Geographic Stability (3 tours)

☐ H. Professional Certification Program

☐ I. Compressed Work Schedule

☐ J. Guaranteed Barracks Room while In-Port

☐ K. BAH while on sea duty

☐ L. Lump sum SRB

☐ M. Transferability of GI Bill benefits (to spouse or child)

***Dollar Value (of SRB) you would be willing to give up for the checked options:

[   ]

14. List any other non-monetary incentive(s) that the Navy could offer which would be attractive to you and the amount of the bonus (in dollars) you would be willing to give up to receive that incentive. "Out of the box" answers are encouraged and accepted. (Example: Designated Parking Spot-$1000.00)

The following demographic questions are necessary for data/trend analysis. This information will not be used to identify individuals.

15. What is your age?

○ A. Under 21

○ B. 21-27

○ C. 28-42

○ D. Over 42

16. What is your current marital status?

○ A. Single, never married

○ B. Married

○ C. Married to military member

○ D. Divorced, Separated, Widowed

17. What is your gender?

○ A. Male

○ B. Female

18. What is the highest level of education you have completed?

○ A. GED or equivalent

○ B. High School

○ C. Associates Degree

○ D. Bachelors Degree

○ E. Masters or Higher

19. How many dependents (not including your spouse) do you have?

○ A. 0

○ B. 1-2

○ C. 3-4

○ D. 5 or greater

20. What is your current paygrade?

◯ A. E-1 – E-3 (undesignated)

◯ B. E-1 – E-3 (designated)

◯ C. E-4

◯ D. E-5

◯ E. E-6

◯ F. E-7 or above

21. What is your current rating?

◯ A. AC

◯ B. FC

◯ C. FC (AEGIS)

◯ Other (please specify)

_____

22. What NECs do you hold?

23. Where are you currently serving?

◯ A. Sea

◯ B. Shore

◯ C. Overseas

◯ D. Student

◯ E. Individual Augmentation (IA) – please give location and length of IA

24. Have you ever been assigned an IA? If yes, when, where and for how long? (excluding present duty)

25. Which fleet is your homeport?

○ A. COMSECONDFLT (Norfolk/Mayport/Ingleside)

○ B. COMTHIRDFLT (San Diego/Everett/Pearl)

○ C. COMFIFTHFLT (Bahrain)

○ D. COMSIXFLT (Naples)

○ E. COMSEVENTHFLT (Yokosuka/Sasebo/Guam)

○ F. Other (please specify) _____

26. How many years of active service have you completed?

○ A. 0-2 years

○ B. more than 2 but less than 4

○ C. more than 4 but less than 6

○ D. more than 6 but less than 10

○ E. 10 years or more

27. What is your race/ethnic descent?

○ A. White/Caucasian

○ B. Black/African American

○ C. Asian/Pacific Islander

○ D. Native American/Aleut/Eskimo

○ E. Spanish/Hispanic/Latino

○ F. Other (please specify)

_____

28. What is your home of record (state/country)?
*Home of record is where you were living when you enlisted.

_____

Thank you for participating in our survey!

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APPENDIX B.   SRB AND NMI VALUE DISTRIBUTIONS

For presentation purposes, all figures were truncated at 40% on the vertical axis. On the horizontal axis, the SRB Requirements Distribution display was truncated at $150,000 and the Value Distribution displays were truncated at $30,000. Percent of Responses was calculated using all observations.

Mean and maximum values were calculated excluding outliers where indicated (*). Outliers were defined as SRB Requirements of $500,000 and above and NMI Values of $100,000 and above. There were three observations that contained outlier values. There were seven individual NMI outlier values: one each for homeport choice, billet choice, telecommuting, three-tour geographic stability, and professional certification, and two for platform choice.

Mean*	47,978
Mode (13%)	50,000
25th Percentile	25,000
Median	45,000
75th Percentile	70,000
90th Percentile	89,000
95th Percentile	100,000
Maximum*	350,000

Homeport Value - $

Mean*	6,358
Mode (33%)	0
25th Percentile	0
Median	5,000
75th Percentile	10,000
90th Percentile	20,000
95th Percentile	25,000
Maximum*	50,000

Platform Value - $

Mean*	2,563
Mode (59%)	0
25th Percentile	0
Median	0
75th Percentile	2,136
90th Percentile	10,000
95th Percentile	10,000
Maximum*	50,000

Billet Value - $

Mean*	5,357
Mode (38%)	0
25th Percentile	0
Median	2,000
75th Percentile	10,000
90th Percentile	15,000
95th Percentile	20,000
Maximum*	51,502

Mean	4,706
Mode (59%)	0
25th Percentile	0
Median	0
75th Percentile	5,000
90th Percentile	15,000
95th Percentile	25,000
Maximum	65,000

Sabbatical Value - $

Mean*	5,862
Mode (47%)	0
25th Percentile	0
Median	1
75th Percentile	7,500
90th Percentile	20,000
95th Percentile	25,000
Maximum*	70,000

Telecommuting Value - $

Mean	4,609
Mode (47%)	0
25th Percentile	0
Median	0
75th Percentile	5,000
90th Percentile	12,800
95th Percentile	20,000
Maximum	50,000

2 tour Geographic Stability Value - $

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3 Tour Geographic Stability Value - $

Mean*	6,620
Mode (44%)	0
25th Percentile	0
Median	1,000
75th Percentile	10,000
90th Percentile	20,000
95th Percentile	35,000
Maximum*	80,000

Professional Certification Value - $

Mean*	3,627
Mode (56%)	0
25th Percentile	0
Median	0
75th Percentile	5,000
90th Percentile	10,000
95th Percentile	20,000
Maximum*	60,000

Compressed Work Week Value - $

Mean	3,289
Mode (55%)	0
25th Percentile	0
Median	0
75th Percentile	5,000
90th Percentile	10,000
95th Percentile	15,000
Maximum	41,206

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Mean	6,678
Mode (43%)	0
25th Percentile	0
Median	1,000
75th Percentile	10,000
90th Percentile	20,000
95th Percentile	30,000
Maximum	75,000

GI Bill Transferability Value - $

Mean	628
Mode (81%)	0
25th Percentile	0
Median	0
75th Percentile	0
90th Percentile	500
95th Percentile	4,798
Maximum	25,000

Barracks Room on Sea Duty Value - $

Mean	1,433
Mode (80%)	0
25th Percentile	0
Median	0
75th Percentile	0
90th Percentile	5,000
95th Percentile	10,000
Maximum	50,000

BAH on Sea Duty Value - $

Mean		**4,400**
Mode (80%)		**0**
25th Percentile		**0**
Median		**0**
75th Percentile		**5,000**
90th Percentile		**10,000**
95th Percentile		**20,000**
Maximum		**90,000**

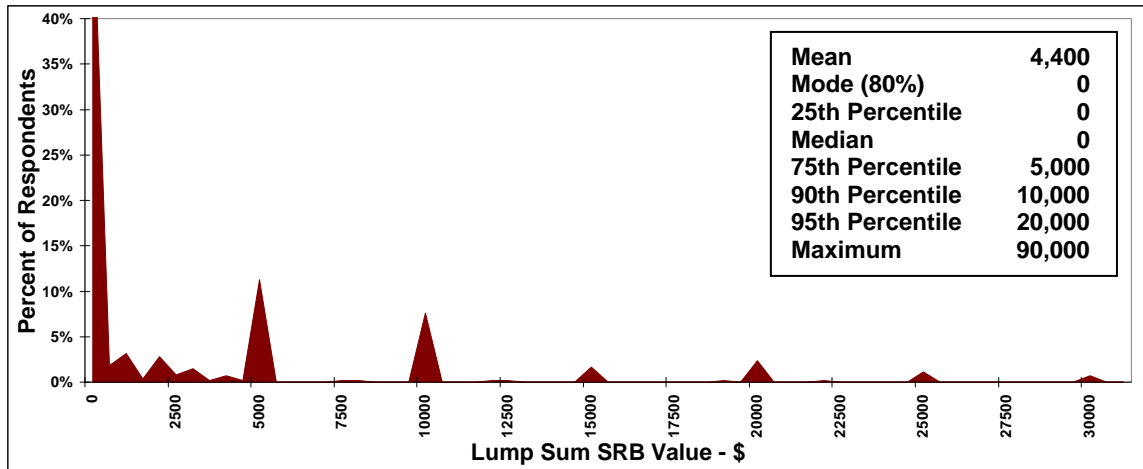# APPENDIX C.   VARYING PERCENTILE (ALL POSITIVE) COST SIMULATION RESULTS

25% Retention.

Overlay Charts and CRAM Savings over Monetary Only:

Universal(1)=UIP(0);Universal(2)=UIP(50);Universal(3)=UIP(100)

UIP Savings/Costs over Monetary Only:

Universal(1)=UIP(0);Universal(2)=UIP(50);Universal(3)=UIP(100)

CRAM Savings over UIP:

Universal(1)=UIP(0);Universal(2)=UIP(50);Universal(3)=UIP(100)

50% Retention.

Overlay Charts and CRAM Savings over Monetary Only:

Universal(1)=UIP(0);Universal(2)=UIP(50);Universal(3)=UIP(100)

UIP Savings/Costs over Monetary Only:

Universal(1)=UIP(0);Universal(2)=UIP(50);Universal(3)=UIP(100)

CRAM Savings over UIP:

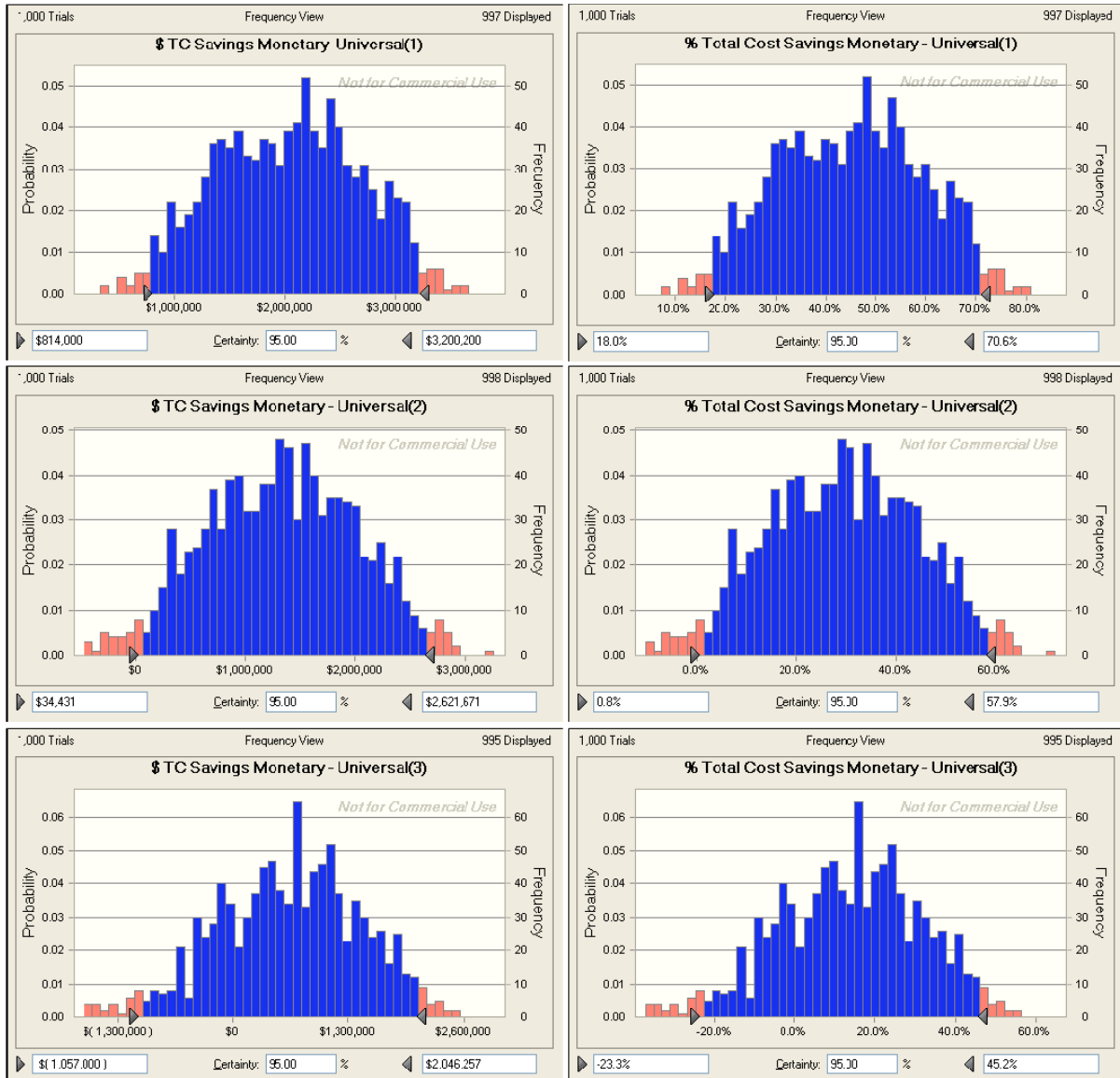**Universal(1)=UIP(0);Universal(2)=UIP(50);Universal(3)=UIP(100)**

75% Retention.

Overlay Charts and CRAM Savings over Monetary Only:

Universal(1)=UIP(0);Universal(2)=UIP(50);Universal(3)=UIP(100)

UIP Savings/Costs over Monetary Only:

Universal(1)=UIP(0);Universal(2)=UIP(50);Universal(3)=UIP(100)

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CRAM Savings over UIP:

Universal(1)=UIP(0);Universal(2)=UIP(50);Universal(3)=UIP(100)

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APPENDIX D. VARYING PERCENTILE COST (HIGH POSITIVE) SIMULATION RESULTS

25% Retention.

Overlay Charts and CRAM Savings over Monetary Only:

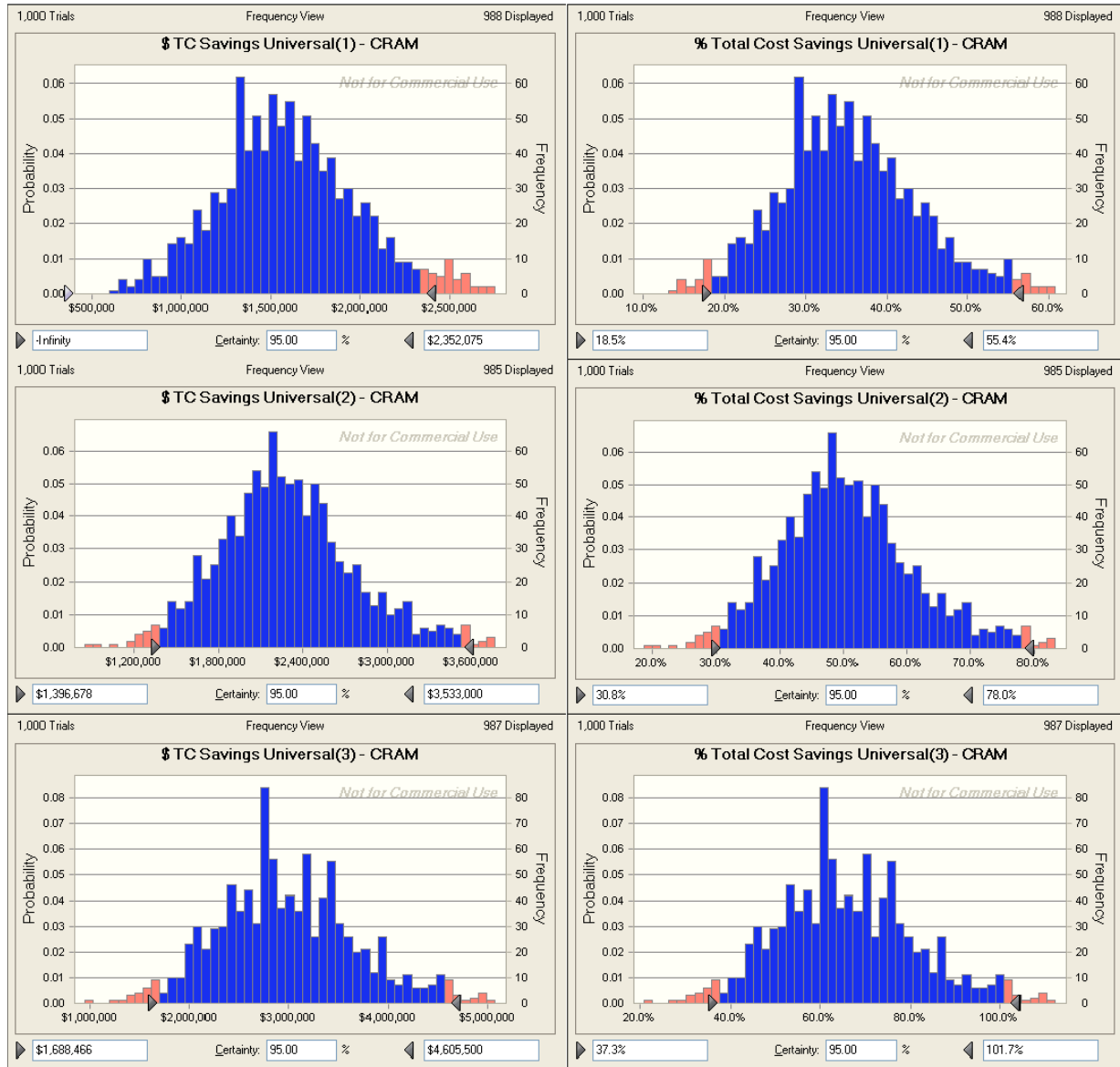**Universal(1)=UIP(0);Universal(2)=UIP(50);Universal(3)=UIP(100)**

UIP Savings/Costs over Monetary Only:

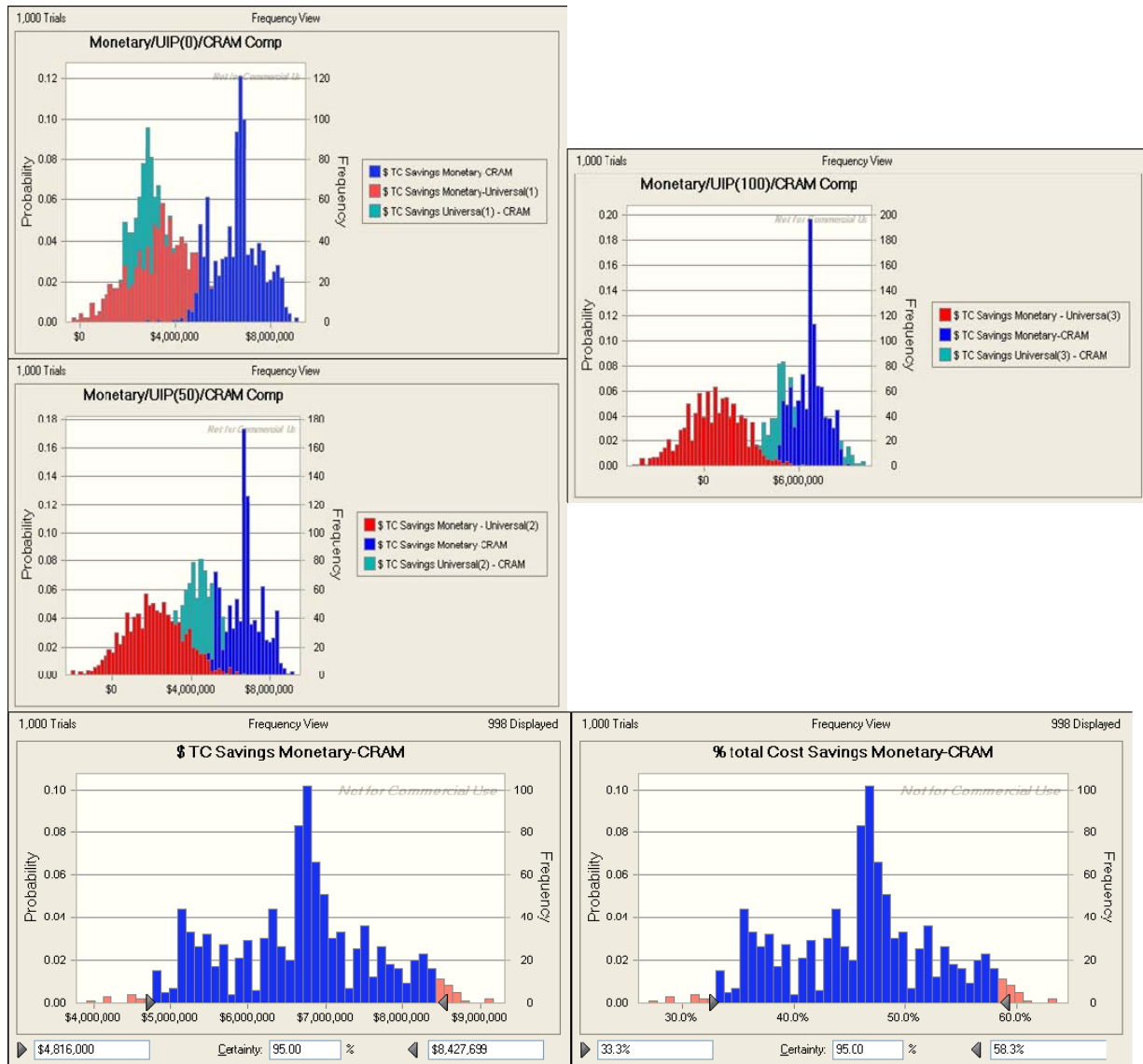**Universal(1)=UIP(0);Universal(2)=UIP(50);Universal(3)=UIP(100)**

CRAM Savings over UIP:

Universal(1)=UIP(0);Universal(2)=UIP(50);Universal(3)=UIP(100)

50% Retention.

Overlay Charts and CRAM Savings over Monetary Only:

Universal(1)=UIP(0);Universal(2)=UIP(50);Universal(3)=UIP(100)

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UIP Savings/Costs over Monetary Only:

Universal(1)=UIP(0);Universal(2)=UIP(50);Universal(3)=UIP(100)

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CRAM Savings over UIP:

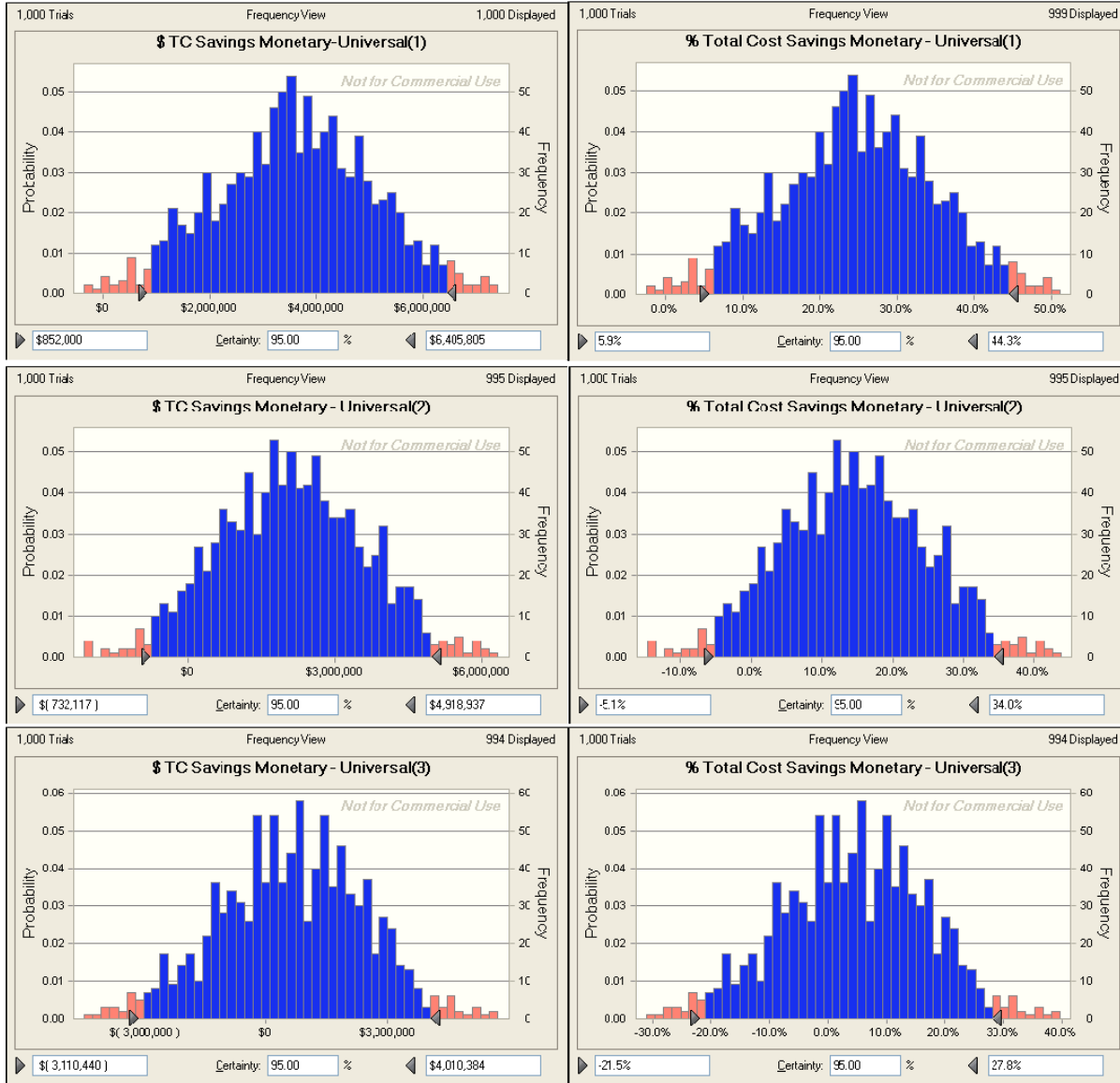**Universal(1)=UIP(0);Universal(2)=UIP(50);Universal(3)=UIP(100)**

75% Retention.

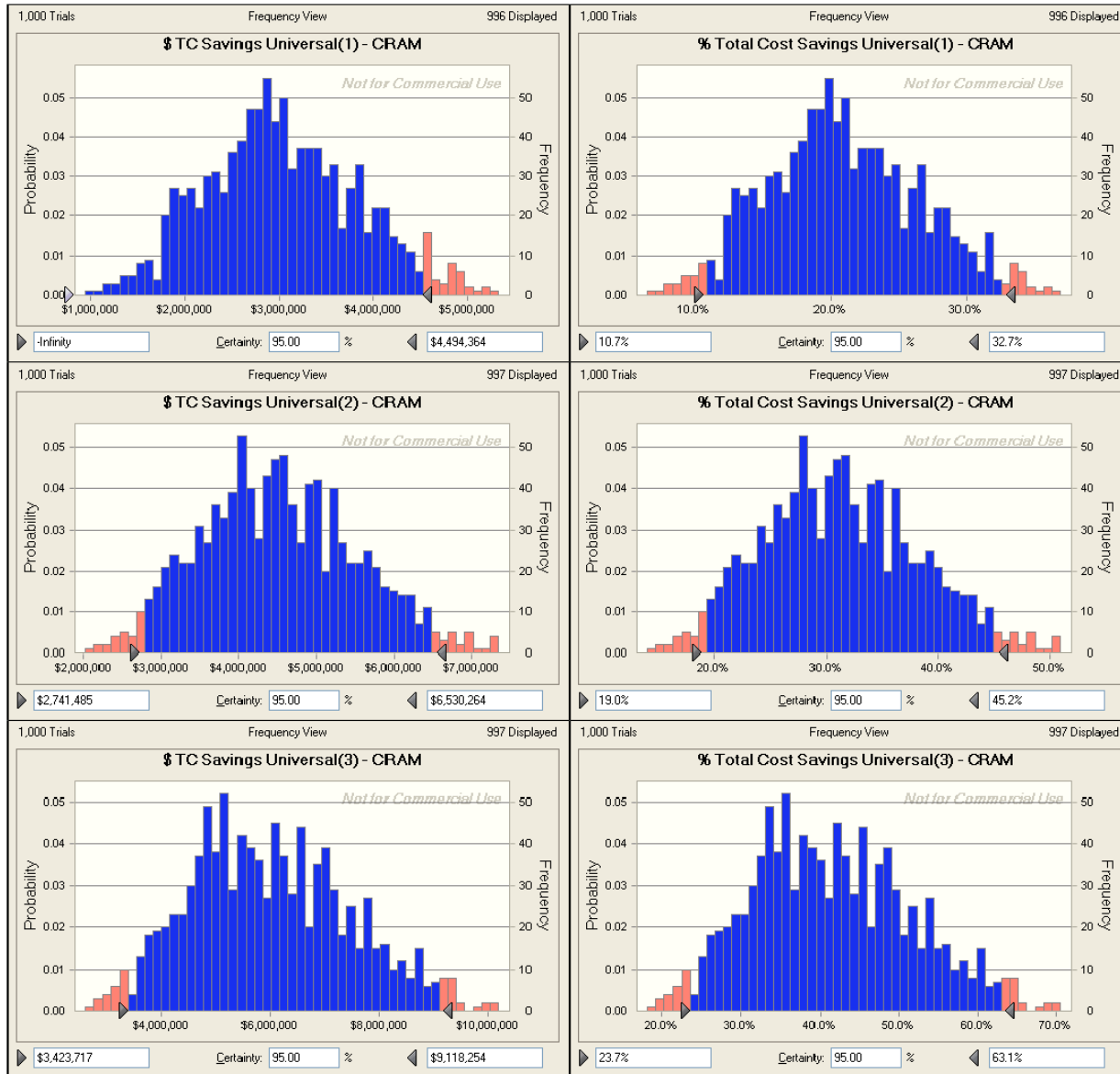**Overlay Charts and CRAM Savings over Monetary Only:**

Universal(1)=UIP(0);Universal(2)=UIP(50);Universal(3)=UIP(100)

UIP Savings/Costs over Monetary Only:

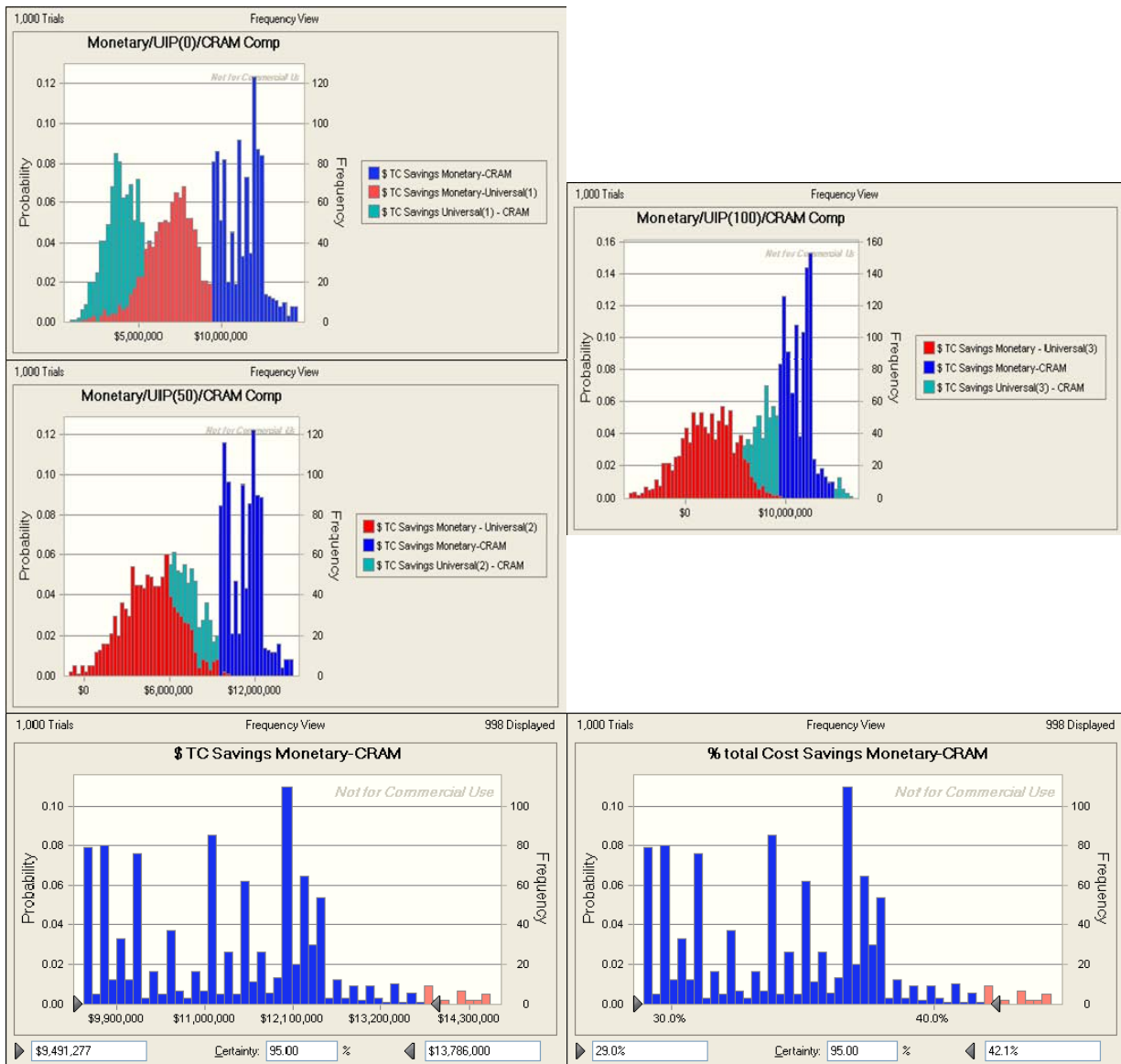**Universal(1)=UIP(0);Universal(2)=UIP(50);Universal(3)=UIP(100)**

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CRAM Savings over UIP:

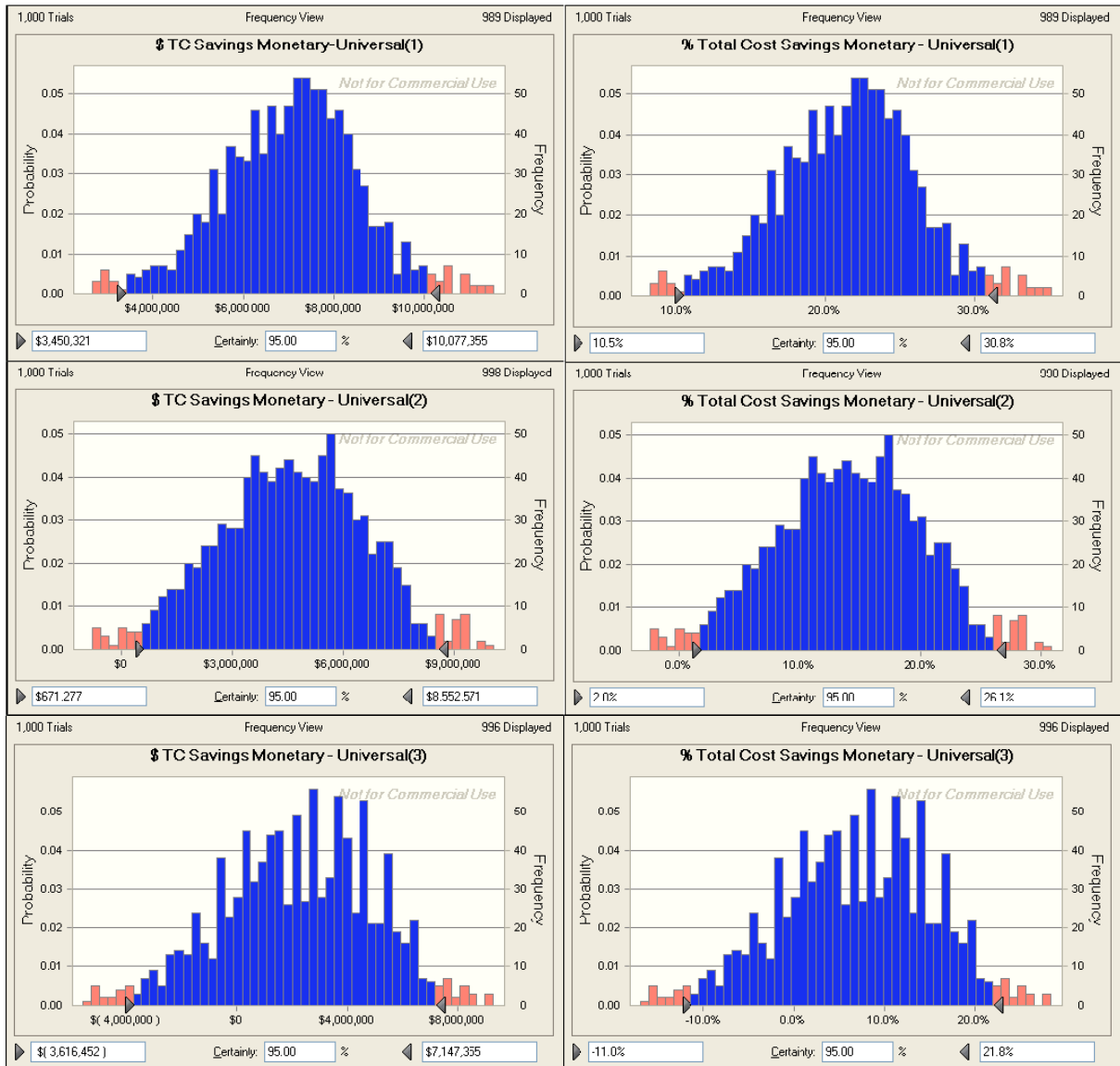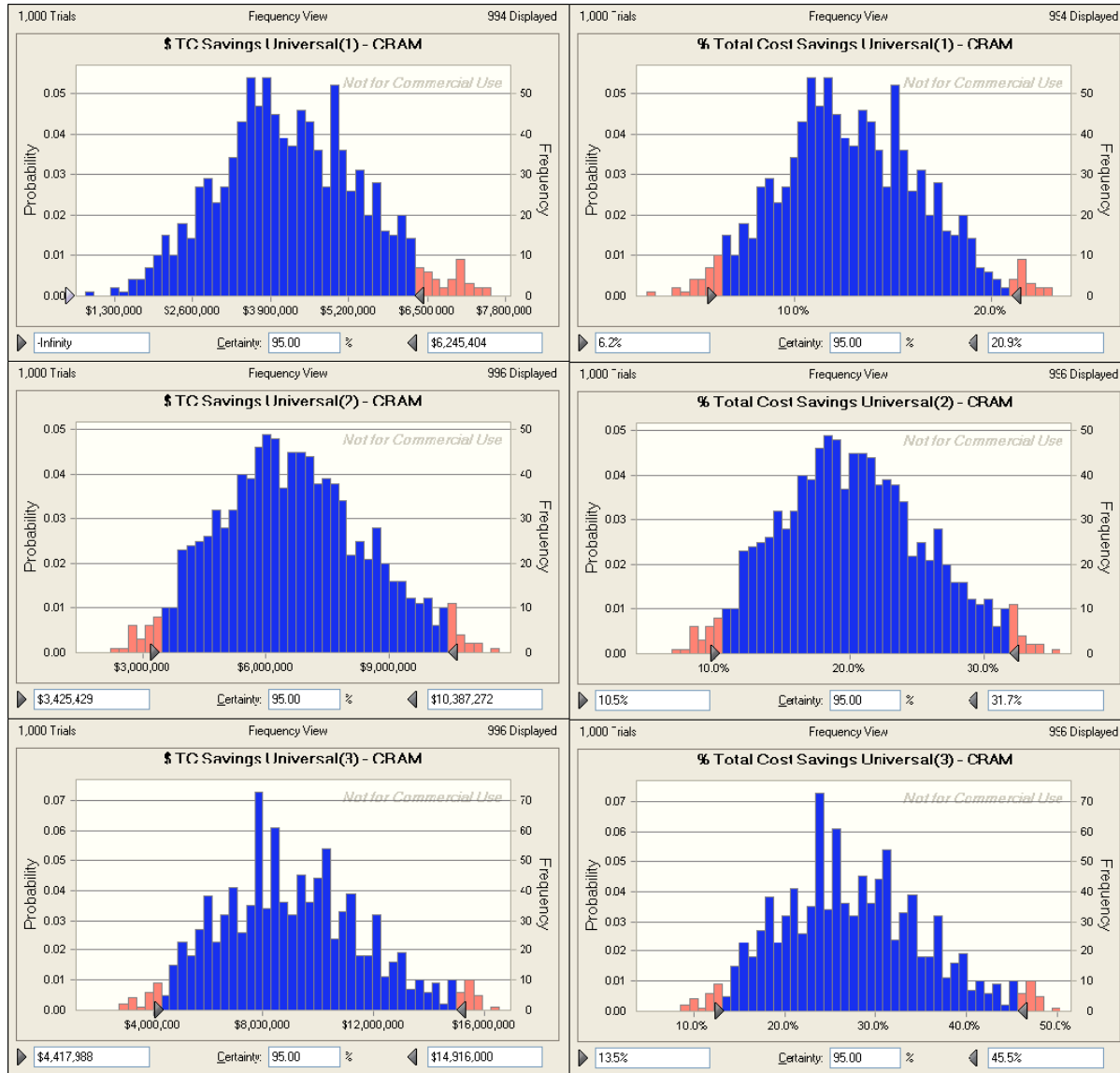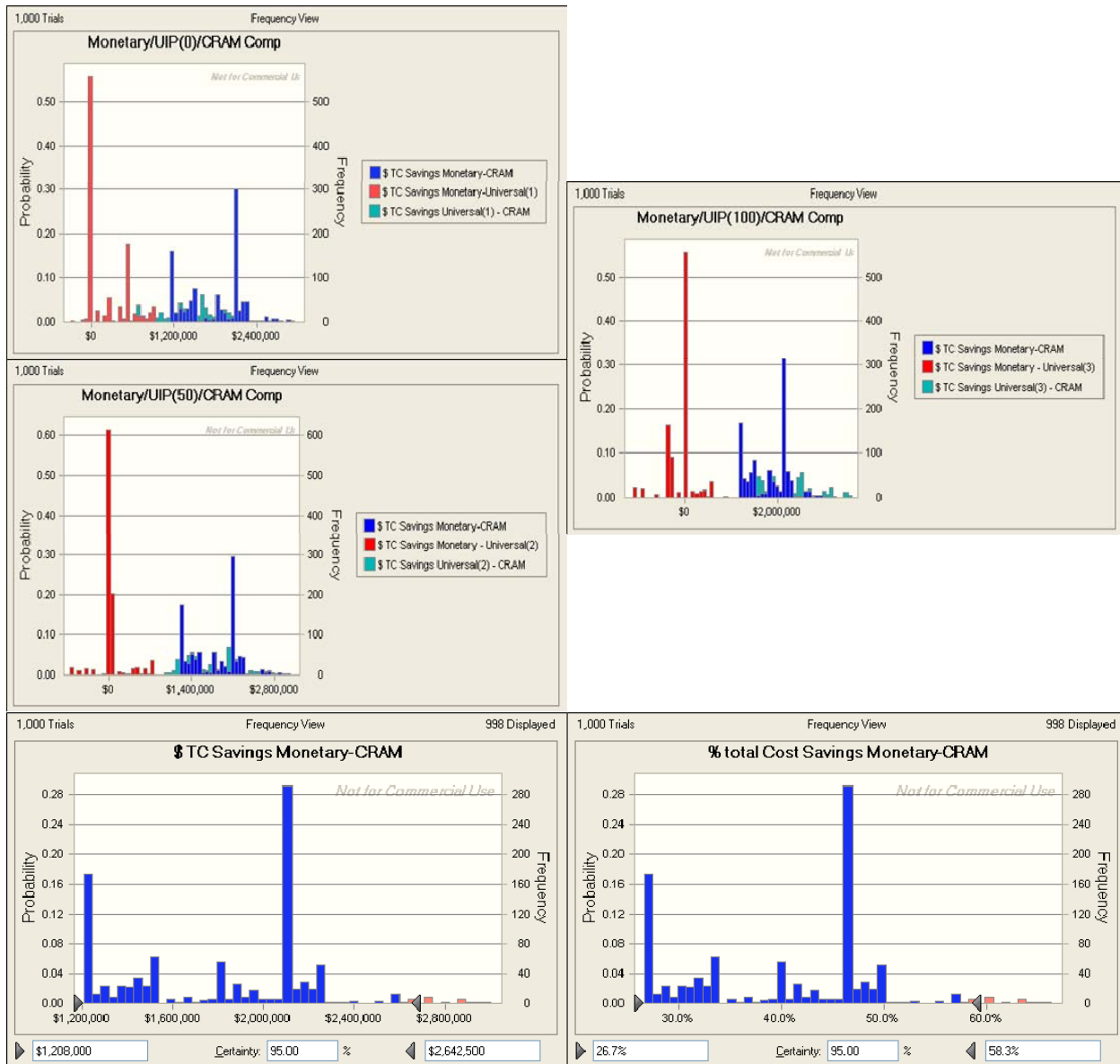**Universal(1)=UIP(0);Universal(2)=UIP(50);Universal(3)=UIP(100)**

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NMIs Offered: All.

Monetary - Gender

- male — 81%
- female — 16%
- no ans — 3%

CRAM - Gender

- male — 84%
- female — 14%
- no ans — 2%

Monetary - Race

- white — 62%
- black — 18%
- asian_pi — 3%
- native american — 2%
- hispanic — 9%
- other_race — 3%
- no answer — 3%

CRAM - Race

- white — 65%
- black — 17%
- asian_pi — 2%
- native american — 1%
- hispanic — 9%
- other_race — 3%
- no answer — 3%

Monetary - Education

- ged — 3%
- hs — 72%
- assoc_deg — 16%
- bach_deg — 7%
- masters — 0%
- no ans — 2%

CRAM - Education

- ged — 2%
- hs — 61%
- assoc_deg — 24%
- bach_deg — 9%
- masters — 1%
- no ans — 3%

Monetary - Age

- age_under 21 — 5%
- age_21_27 — 40%
- age_28_42 — 53%
- age_over 42 — 1%
- no ans — 1%

CRAM - Age

- age_under 21 — 8%
- age_21_27 — 40%
- age_28_42 — 49%
- age_over 42 — 1%
- no ans — 2%

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Maximum Increase in Representation: Female

NMIs Offered: Homeport and Billet.

Monetary - Gender
- male 81%
- female 16%
- no ans 3%

CRAM - Gender
- male 77%
- female 21%
- no ans 2%

Monetary - Race
- white 62%
- black 18%
- asian_pi 3%
- native american 2%
- hispanic 9%
- other_race 3%
- no answer 3%

CRAM - Race
- white 65%
- black 18%
- asian_pi 3%
- native american 1%
- hispanic 9%
- other_race 1%
- no answer 3%

Monetary - Education
- ged 3%
- hs 72%
- assoc_deg 16%
- bach_deg 7%
- masters 0%
- no ans 2%

CRAM - Education
- ged 3%
- hs 64%
- assoc_deg 21%
- bach_deg 9%
- masters 1%
- no ans 2%

Monetary - Age
- age_under 21 5%
- age_21_27 40%
- age_28_42 53%
- age_over 42 1%
- no ans 1%

CRAM - Age
- age_under 21 5%
- age_21_27 36%
- age_28_42 55%
- age_over 42 2%
- no ans 2%

Maximum Increase in Representation: African American (black)

NMIs Offered: Homeport, Compressed Work Week, Lump Sum SRB

Monetary - Gender

- male
- female
- no ans

3%, 16%, 81%

CRAM - Gender

- male
- female
- no ans

1%, 17%, 82%

Monetary - Race

- white
- black
- asian_pi
- native american
- hispanic
- other_race
- no answer

3% 3%, 9%, 2%, 3%, 18%, 62%

CRAM - Race

- white
- black
- asian_pi
- native american
- hispanic
- other_race
- no answer

3%, 1%, 9%, 1%, 3%, 20%, 63%

Monetary - Education

- ged
- hs
- assoc_deg
- bach_deg
- masters
- no ans

2%, 0%, 3%, 7%, 16%, 72%

CRAM - Education

- ged
- hs
- assoc_deg
- bach_deg
- masters
- no ans

1%, 1%, 3%, 9%, 20%, 66%

Monetary - Age

- age_under 21
- age_21_27
- age_28_42
- age_over 42
- no ans

1%, 5%, 1%, 40%, 53%

CRAM - Age

- age_under 21
- age_21_27
- age_28_42
- age_over 42
- no ans

1%, 6%, 1%, 36%, 56%

169

Maximum Increase in Representation: Hispanic

NMIs Offered: Platform, 2-tour Geographic Stability, Professional Certification, Lump Sum SRB

Monetary - Gender

male 81%
female 16%
no ans 3%

CRAM - Gender

male 85%
female 14%
no ans 1%

Monetary - Race

white 62%
black 18%
asian_pi 3%
native american 2%
hispanic 9%
other_race 3%
no answer 3%

CRAM - Race

white 66%
black 13%
asian_pi 3%
native american 1%
hispanic 13%
other_race 1%
no answer 3%

Monetary - Education

ged 3%
hs 72%
assoc_deg 16%
bach_deg 7%
masters 0%
no ans 2%

CRAM - Education

ged 3%
hs 65%
assoc_deg 21%
bach_deg 9%
masters 1%
no ans 1%

Monetary - Age

age_under 21 5%
age_21_27 40%
age_28_42 53%
age_over 42 1%
no ans 1%

CRAM - Age

age_under 21 5%
age_21_27 38%
age_28_42 54%
age_over 42 2%
no ans 1%

Maximum Increase in Representation: Education, at or above Associate's Degree

NMIs Offered: Homeport, Platform, Sabbatical, Telecommuting, Compressed Week, Barracks Room at Sea, Lump Sum SRB
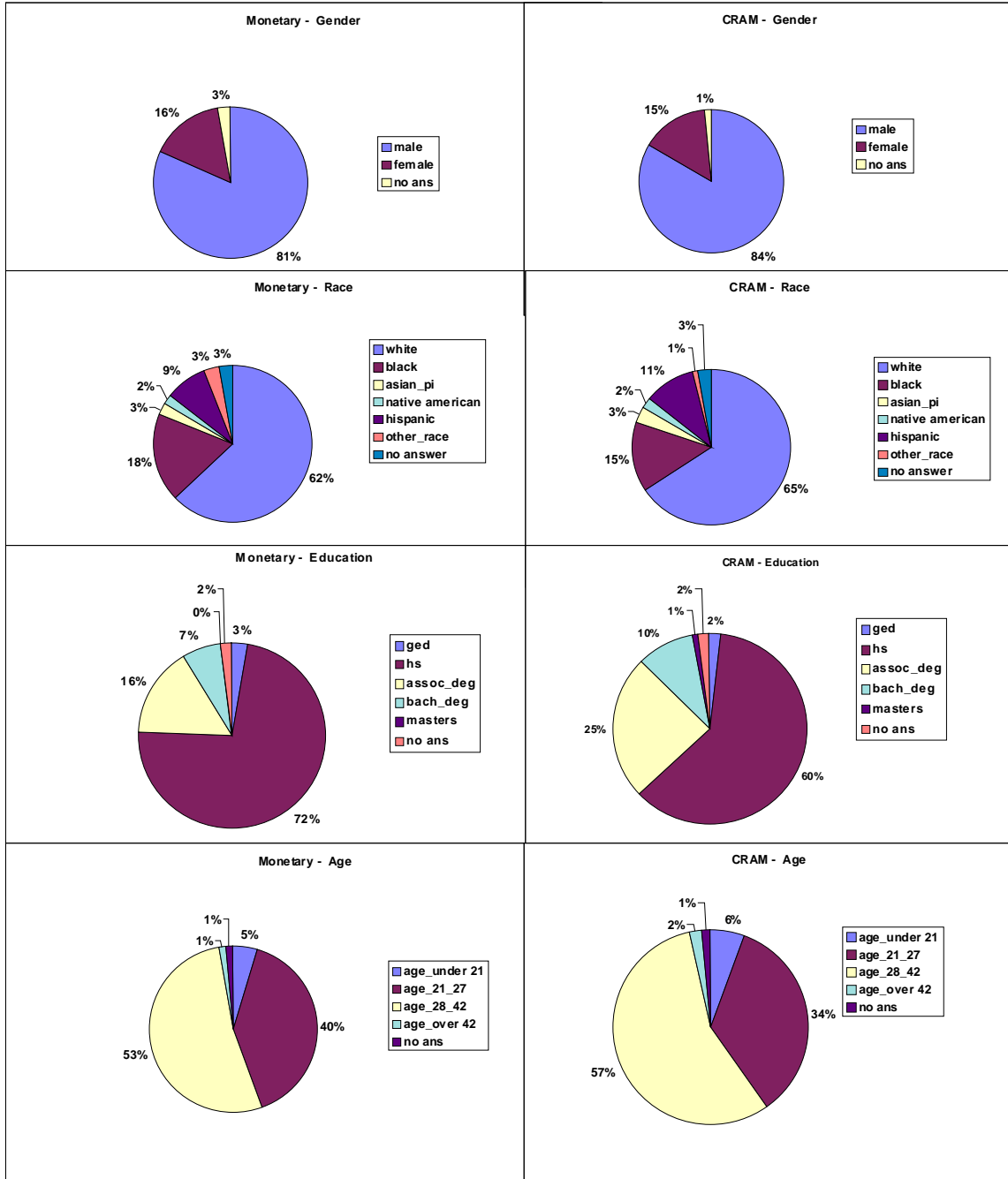
Maximum Increase in Representation: Generation Y

NMIs Offered: Platform, Billet, Sabbatical, Telecommuting, 3-tour Geographic Stability, Professional Certification, Compressed Week, Barracks Room at sea, Lump Sum SRB
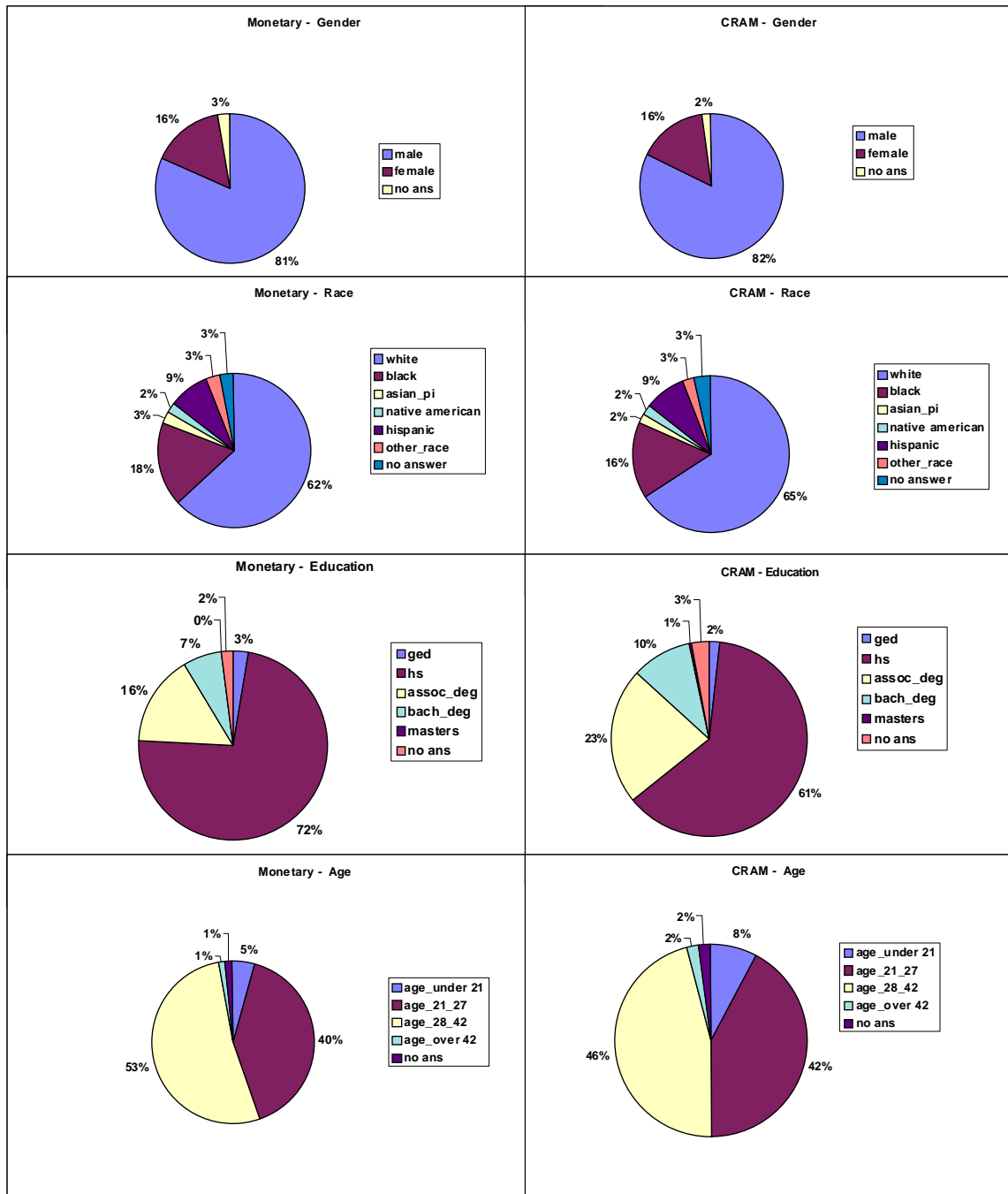

Monetary - Gender
- male 81%
- female 16%
- no ans 3%

CRAM - Gender
- male 82%
- female 16%
- no ans 2%

Monetary - Race
- white 62%
- black 18%
- asian_pi 3%
- native american 2%
- hispanic 9%
- other_race 3%
- no answer 3%

CRAM - Race
- white 65%
- black 16%
- asian_pi 2%
- native american 2%
- hispanic 9%
- other_race 3%
- no answer 3%

Monetary - Education
- ged 3%
- hs 72%
- assoc_deg 16%
- bach_deg 7%
- masters 0%
- no ans 2%

CRAM - Education
- ged 2%
- hs 61%
- assoc_deg 23%
- bach_deg 10%
- masters 1%
- no ans 3%

Monetary - Age
- age_under 21 5%
- age_21_27 40%
- age_28_42 53%
- age_over 42 1%
- no ans 1%

CRAM - Age
- age_under 21 8%
- age_21_27 42%
- age_28_42 46%
- age_over 42 2%
- no ans 2%

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